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An Interphysiographic Analysis of Herb and Shrub Vegetation in Virginia Forests

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This is to certify that the thesis prepared by Stephen James Binns entitled An Interphysiographic Analysis of Herb and Shrub Vegetation in Virginia Forests has been approved by his committee as satisfactory completion of the thesis requirement for the Master of Science degree in Biology.

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An Interphysiographic Analysis
of Herb and Shrub Vegetation
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By

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ABSTRACT

Thirty upland deciduous stands were sampled from the mid-Coastal Plain to the mid-Piedmont in New Kent, Hanover, and Louisa Counties. Density data for herb and shrub species were collected and soil samples were collected in each stand. A cluster analysis of the vegetation data was performed using Euclidean Distance and "furthest-neighbor" clustering. Four clusters of stands were identified. A cluster of six stands with *Euonymus americanus* as the dominant species was strongly related to the Coastal Plain, but the other clusters were not physiographically associated. Other important species in the analysis were *Vaccinium vacillans*, *Gaylussacia baccata*, and *Mitchella repens*.

The soil nutrients most strongly correlated with the dominant species were calcium and magnesium. *Euonymus americanus* and associated species were positively correlated with these nutrients and the ericaceous shrubs were negatively correlated.

INTRODUCTION

Casual observation reveals that Virginia upland forests are often dominated by pines which are successional tree species. The successional nature of Virginia forests is due mainly to the repeated cutting of timber over the past two to three hundred years and the periodic cultivation and abandonment of most of the potential upland farmland in earlier days (Wingo 1949). Thus there is virtually no virgin forest left in the state. However, a longstanding interest of plant ecology has been to describe potential or climax vegetation of forest regions. This aim is often attempted by surveying stands that have had sufficient time to return somewhat to their former compositions. These late successional stands are also valuable in comparing the effects of environmental variables in different areas because the effects of man on the stand compositions are minimized.

In Virginia, the Coastal Plain and Piedmont physiographic provinces are quite distinct geologically, topographically, pedologically and to some extent climatologically. The Piedmont is considered to be a degraded peneplane of the older Appalachians, dating mostly from the Precabrian (>230 million years) through the Paleozoic (>600 million years) (Dietrich 1970). Thus, the soils are derived from residual material, and the land is well dissected by streams and drainageways.

The Coastal Plain however, is an exposed region of the Continental Shelf dating from the Tertiary period (1-70 million years). The soils are therefore sedimentary in origin and the topography is more youthful, being less dissected by streams that the Piedmont (Fenneman 1938).

The Coastal Plain is slightly warmer and on the average receives slightly more precipitation than the Piedmont. In January, the Coastal Plain averages 3.9^{o} C which is 1.1^{o} C warmer than the eastern or western Piedmont. In July the Coastal Plain averages 25.5^{o} C which is 0.6^{o} C warmer than the eastern Piedmont and 1.1^{o} C warmer than the western Piedmont. The annual precipitation of the Coastal Plain is 1076.4 mm, which is 26.4 mm more than the eastern Piedmont and 7.4 mm more than the western Piedmont (U.S. Dept. of Commerce 1973).

Floristic differences between the two provinces have been documented in Virginia. Plant species characteristic of the southern United States which range north into Virginia are most commonly found only on the Coastal Plain. Harvill et al. (1977) estimate that approximately 260 southern species occur in Virginia, of which 200 are found only on the Coastal Plain.

Several investigators have examined the relationship of the vegetation to soils in Virginia and adjacent North Carolina. Gemborys (1974) sampled hardwood forest vegetation and soils in Prince Edward County, Virginia, and similar research has been performed in North Carolina in Granville County (Dayton 1966), Durham County (Nemeth 1968), and Moore County (Sechrest and Cooper 1970). All of these are Piedmont counties except sixty percent of Moore County which is Coastal Plain.

The Moore County research suggests that the vegetation of the two physiographic provinces differs because of the greater amounts of sand and lower base status of soils on the Coastal Plain. Although herb species had similar importance on both provinces, the tree canopy differed in species composition, and shrub species were less important in Coastal Plain stands.

However, the applicability of the North Carolina results to Virginia is uncertain for several reasons. The Coastal Plain in Moore County is made up of low sandy ridges or "Sandhills" (Sechrest and Cooper 1970) which are not common in the Virginia Coastal Plain. Also, the applicability of the Moore County research is affected by the limited study area which only includes one county. Braun (1950) separated the Coastal Plain vegetation of the two states into two different vegetation regions. The Coastal Plain in North Carolina and Virginia south of the James River belong to the Southeastern Evergreen Forest region. However, the Coastal Plain north of the James River, and the Piedmont region in both states belong to the Oak-Pine forest region. Thus from Braun's work it may be tentatively assumed that interphysiographic variation in the vegetation would be greater in North Carolina than in Virginia.

It is evident therefore, that although the climate and soils of the two provinces in Virginia differ, any vegetational differences between the provinces have not been clearly documented for Virginia. Thus, this study was performed for the purpose of identifying the vegetational differences that exist between the two provinces in Virginia and to determine what edaphic and climatic variables are related to the vegetational differences either between or within the provinces. Research was restricted to upland deciduous stands that had not been disturbed for twenty years or more. Only shrub and herb vegetation was sampled because of research time limitations, and also because selective logging, which is a common practice in Virginia forests, would show less affect on herbs and shrubs than trees.

THE STUDY AREA

Forest Vegetation

The forest vegetation of the Virginia Coastal Plain and Piedmont has been described by several investigators. Braun (1950) recognized two major forest regions in these two areas in her survey of eastern deciduous forest, the Oak-Pine and the Southeastern Evergreen Forest regions. The Oak-Pine is the more extensive of the two in Virginia, covering the Coastal Plain north of the James River and virtually all of the Piedmont. The Southeastern Evergreen Forest region covers the Coastal Plain south of the James River. Both regions extend southward along the Atlantic Coast and then westward along the Gulf Coast.

A major difference in the two regions is that pines and broadleaf evergreens are more important in the Southeastern Evergreen region. However, Braun considered the pines in both regions to be a product of man's disturbance, and the most prevalent climax vegetation of both regions to be oak or oak-hickory forest.

The Southeastern Evergreen Forest region in Virginia also contains many plant species characteristic of the south Atlantic states. North of the James River many of these south Atlantic species are absent or present only in isolated locations.

Ware (1970) found that the College Woods at Williamsburg, located in the Coastal Plain, was strongly related to the Southern Mixed Hardwood Forest (SMHF) described by Quarterman and Keever (1962).

The SMHF is an abstract climax vegetation region that covers the southeastern Coastal Plain of the United States, virtually the same area designated by Braun as the Southeastern Evergreen Forest region. A number of tree species of high importance are present in this forest type rather than one or two species being dominant.

In the College Woods the important tree species were _Quercus alba_, _Liriodendron tulipifera_, _Pinus taeda_, _Fagus grandifolia_, _Quercus falcata_, and _Acer rubrum_. Important shrub species were _Cornus florida_, _Myrica cerifera_, _Euonymus americanus_, _Vaccinium_ spp., and _Sassafras albidum_.

Harvill et al. (1977) consider mixed hardwood forest types containing beech, maple, and tuliptree to be important on marl areas of the Coastal Plain and also on areas underlain by marble on the Piedmont.

A ravine slope forest in Surry County described by Ackerman (Braun 1950) was also of a mixed hardwood type, in which the major tree species were _Fagus grandifolia_, _Liriodendron tulipifera_, and _Carya cordiformis_. Braun (1950) termed this stand a mesophytic mixed hardwood community, and noted the occasional presence of similar forest communities on ravine slopes throughout much of the Southeastern Evergreen Forest region and on slopes above bottomland in the Oak-Pine region.

The most widespread deciduous forest type in the Piedmont and to a lesser extent in the Coastal Plain is the oak or oak-hickory forest (Harvill et al. 1977). Gemborys (1974) found two major types of oak and oak-hickory stands on the uplands in Prince Edward County, located in the south-central Piedmont. On xeric upland stands the dominant tree species were oaks which include _Quercus prinus_, _Q. rubra_,

Q. falcata, and Q. stellata. Important liana, shrub, and subshrub species were Vaccinium spp., Ampelopsis arborea, and Chimaphila maculata. On more mesic sites Q. alba, Carya tomentosa, Pinus echinata, Acer rubrum, and other pines and hardwoods were common trees. Important shrub, liana, and understory species on mesic sites were Cercis canadensis, Cornus florida, Parthenocisis quinquefolia, and Vitis rotundifolia.

Scanlan (1976) studied several mesic upland hardwood stands adjacent to Lake Anna in Louisa County, which is located in the north-central Piedmont. Three of these stands were characterized by Quercus alba, the dominant tree species. Other important tree species in these three stands were Q. falcata, Carya spp., and Liriodendron tulipifera. Important shrubs and understory species were Euonymus americanus, Vaccinium spp., and Cornus florida, and important herbs and subshrubs were Desmodium nudiflorum, Chimaphila maculata, and Mitchella repens. Fagus grandifolia was the dominant tree in two post-logging successional stands with Q. alba, Carya spp., Liriodendron tulipifera, and Acer rubrum of lesser importance. Shrub vegetation in these stands was similar to that in the oak dominated stands although Kalmia latifolia was very dense in one stand. Important herbs in these stands were Carex spp., Galium sp., and several species of grasses. The beech dominated stands mentioned here seem to be related to the mesophytic mixed hardwoods mentioned by Braun (1950) and the Beech-Maple-Tuliptree forest mentioned by Harvill et al. (1977). Both of these stands were located on slopes above the North Anna River, and thus correspond to the site description given by the above-mentioned authors for this forest type.

Soils

Common soils in the Coastal Plain portion of the study area are of the Faceville, Marlboro, and Kempsville series. Soils of lesser importance are of the Sassafras and Caroline series in the more eastern stands and the Craven, Duplin, and Bourne series in the more western Coastal Plain stands. These soils are all sedimentary in origin. The study area soils in the Coastal Plain are most commonly sandy loams and fine sandy loams and range from very strongly to medium acid (pH 4.5 to 6.0); (USDA unpublished, VPI & SU no date [n.d.]).

The Piedmont portion of the study area includes several major soils all of which have originated from igneous parent material. An association of Cecil and Appling soils extends from the fall zone (the eastern edge of the Piedmont) for approximately 48 km westward. These soils are primarily loams, sandy loams, and fine sandy loams are derived from granite, gneiss, and schist. Other important soils include the Wedowee, Fluvanna, Tallapoosa, and Worsham soils. These soils are extremely to strongly acidic (pH below 4.6 to 5.5); (VPI & SU n.d., USDA 1976).

West of the Cecil and Appling zone the Nason-Tatum soil association extends for approximately 6.5 km. These western soils are derived from sericite schist and are silt loams on the three study sites in this region. They are typically very strongly acidic (pH 4.5 to 5.0).

West of the Nason-Tatum association, soils in the study area are Grover sandy loam and Colfax and Durham fine sandy loams. They are derived from granite and granite gneiss, and range from very strongly acidic to strongly acidic (pH 4.5 to 5.5).

Thus the soils of both provinces are similar texturally and are classified as loams and fine sandy loams with the exception of the Nason and Tatum silt loams in three Piedmont stands. The pH may occur at an equally low acidity in both provinces ranging down to 4.5, but may range as high as 6.0 in the Coastal Plain as compared to only 5.5 in the Piedmont.

METHODS

1. Selection of Stands

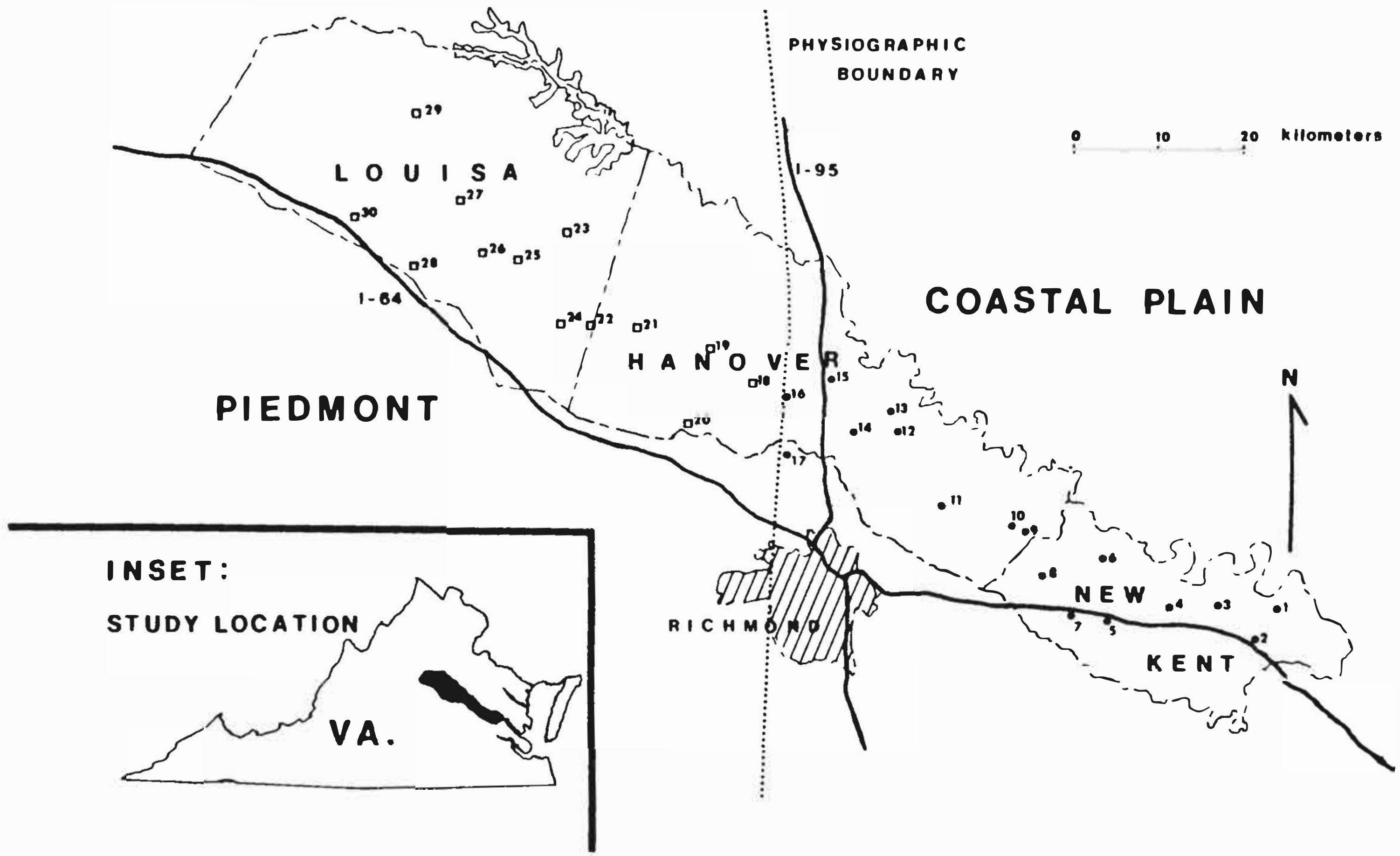
New Kent, Hanover, and Louisa Counties were chosen for study because as shown in Figure 1, they form an unbroken land mass from the mid-Coastal Plain to the mid-Piedmont. The sample stands in these three counties were selected within 8 km of a 116 km transect line with an approximate compass direction of 29^{o} northwest. The transect was divided into six 19.3 km segments and five stands in each segment were selected for detailed study.

Eight of the stands were discovered with the assistance of the Chesapeake Corporation of Virginia and Continental Forest Industries. The other twenty-two stands were selected after extensive field exploration of the transect area with help from several real estate agents and county foresters.

A total of 30 stands was selected for sampling (See Appendix A for stand locations and site descriptions). The stands are number coded from #1 to #30 in ascending order from east to west. Stands #1-17 are located in the Coastal Plain and #18-30 are Piedmont stands.

The stands were selected subjectively by geographic location on the basis of their maturity and lack of disturbance in order to exclude compositional variability due to succession. They were homogeneous upland deciduous (less than 25% pine) forest, and had no evidence of logging or grazing for the last twenty years or more. Stands having a tree canopy cover of eighty-five percent or more were assumed to have

Figure 1. The study area in central Virginia showing the Coastal Plain and Piedmont physiographic provinces, the three county sample area, and the location of the 30 sampled stands. The dotted line is the fall zone which separates the Piedmont from the Coastal Plain. Open square symbols indicate Piedmont stands and closed circles indicate Coastal Plain stands.


PHYSIOGRAPHIC
BOUNDARY
0
10
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kilometers
I-95
LOUISA
HANOVER
COASTAL PLAIN
PIEDMONT
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RICHMOND
NEW
KENT
INSET:
STUDY LOCATION
VA.
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escaped logging for the past twenty years. Stands were also required to have no evident browse line and no remnants of old fence enclosures. When possible, landowners were consulted to verify the absence of disturbance in the recent history of the stands.

2. Vegetation Sampling

In each of the 30 stands, the herb and shrub species were sampled along a 100 m transect line. The transect was positioned more than 30 m from the edge of the stand, thereby reducing the probability of sampling edge species. Occasionally the compass direction of a part of the transect was altered to avoid sampling the 30 m stand margin. In stands with slopes of seven percent or greater, the transect was positioned perpendicular to the slope if possible so that the vegetation was sampled in both high and low areas of the stand. Small streams or swampy areas were sometimes present in the lower areas. When these wet areas were encountered along the transect, sampling was halted at the edge of the dry habitat and continued on the opposite side of the wet area.

Rectangular quadrats of 8 m^2 were randomly placed at fifteen points along the transect line. Their dimensions with respect to the transect line were 2 m parallel to the transect and 4 m perpendicular to it. Each quadrat's location was determined by selecting one of the meter marks along the 100 m transect, using a random numbers table. The quadrats were placed alternately to the left and right side of the transect.

The densities of all herb and shrub species were determined for each quadrat. Trees and woody lianas were not sampled. Herbs were considered to be all non-woody vascular plant species. Shrubs were defined as woody species which normally grow less than 5 m high. The shrub definition, however, is stated only for the purpose of the present research and should not be construed as a strict taxonomic definition.

In most cases herb and shrub density was determined by counting the number of stems emerging from the leaf litter. However for grasses and sedges, the number of fascicles was counted and for ferns the number of clumps was counted. The number of rachises per clump of ferns varied from approximately three for *Polystichum acrostichoides*, to five for *Thelypteris palustris*.

Voucher specimens of species found in the sample quadrats were collected and they were identified to the species level when possible according to the nomenclature of Radford et al. (1968). These vouchers were deposited at the V.C.U. herbarium. Many grasses and immature herbs were difficult to identify because no flowers or fruits were present. Consequently, they and other unknowns were coded as unknown for the analysis.

3. Soil Sampling

In each stand, the soil was sampled along the 100 m vegetation transect line except in two stands where the soil had been disturbed during the six months between vegetation sampling and soil sampling. In stand 11 the soil was sampled from only 50 m of the transect and in stand 24 the soil was sampled in an alternate location in the stand.

The soil sample for a stand consisted of 15 soil cores taken with a 2 cm-diameter soil auger. The 15 cores were alternately collected 5 meters to the right and left side of the 100 meter vegetation transect at regular intervals. At each coring point the litter was brushed aside and the auger pushed through the soil to a depth of 15 cm. This sample depth included only soil from the A horizon in several stands, but in most stands it included the B horizon also. In stands with slopes of 7 percent or more, a separate 15 core sample was collected from the high area of the transect and another 15 core sample was collected from the low area in order to detect soil differences between the topographic areas.

Also in each stand the depth of the A horizon was estimated from several of the cores and recorded. In stands with slopes of 7 percent or greater, the soil depth was measured only on the higher portion of the transect.

The cores for each stand were mixed thoroughly in a clean polyethylene pail. A portion of the stand sample was boxed in a ½ pint cardboard container for chemical analysis. The remaining soil was stored in a linen bag to be used for percentage sand determination.

The packaged samples were transported to the laboratory separately and air dried at 40°C for one to two days. The soil was then stored at room temperature for one to two months before chemical analysis. This long storage period may have caused the measured pH values to be higher than the actual field values because of CO_2 dissipation from the soil (Daubenmire 1974). Nitrogen may also have been lost during storage, but the other nutrients should not have been significantly affected (Allen et al. 1976).

The Soil Testing Laboratory at Virginia Polytechnic Institute and State University analyzed the soil samples for pH, percentage organic matter, phosphorus (P_2O_5), potassium (K_2O), calcium (CaO), magnesium (MgO), nitrogen (NO_3-N), zinc, and manganese (Donohue and McCoy 1977). Percentage sand was determined by the investigator by weighing a homogeneous sample of soil and washing it through a .05 mm soil sieve. The fraction which did not pass through the sieve was dried, weighed, and called sand (Brady 1974). The soil attributes for each stand are presented in Appendix B.

4. Pretreatment of Vegetation Data

The sampled plant species are listed in Appendix C. Grasses were identified only to genus or family in most cases because they seldom possessed flowers or fruits. The notation "Isotria-Medola" refers to the presence of *Isotria verticillata* and/or *Medeola virginiana* within a stand. These two species were not separately identified in several stands because of their similar life forms.

For other plants which could not be unequivocally identified to species the notation "cf." placed before the specific epithet indicates that a plant resembled a certain species. A hypen between two specific epithets indicates that a plant was probably one of the two species.

Shrubs and herbs which were not identifiable were labeled "Unknown Shrub sp. A", "Unknown Shrub sp. B", etc., and "Unknown Herb sp. AA", "Unknown Herb sp. AB", etc. Seedlings which could not be identified as herbs or shrubs were labeled "Unknown Seedling spp."

Due to the length and timing of the sampling period, May 9-July 19, 1977, the following short-lived herbaceous species may have been present in the stands only during part of the sampling season. Because the interest of this research was not in seasonal variables, the following species were not included in further analyses:

Aplectrum hyemale (Muhl. ex. Willd.) Torrey

Botrychium virginianum (L.) Swartz.

Liparis lilifolia L.

Malaxis unifolia L.

Orchis spectabilis L.

Tipularia discolor (Pursh) Nuttall

Unknown Herb sp. AU

Unknown Seedling spp.

5. Computer Analysis of Data

The raw density data were analyzed by Fortran IV programs written by M. J. Scanlan using the IBM 360 computer at the University Computer Center at Virginia Commonwealth University. Cluster analysis of the vegetation data was performed on the same machine using the SAS 76 Cluster procedure (Barr et al. 1976). An SAS subroutine was also used to calculate Kendall's tau correlation coefficient discussed in the text.

RESULTS

1. Cluster Analysis

Cluster analysis is an agglomerative method of forming groups of similar entities. The method is useful because it illustrates multidimensional relationships in two dimensions. Although information is lost in this transformation to two dimensions (Orloci 1967), the cluster analysis is nevertheless quite useful in simplifying large amounts of data. The resulting clusters may often be interpreted in terms of the known environmental gradients (West 1966).

The stand totals of the unstandardized species densities were used in clustering the stands and the similarity measurement was the Euclidean Distance formula employed by Orloci (1967):

$$D_{jk}=\left[\sum_{i=1}^{N} (x_{ij}-x_{ik})^{2}\right]^{\frac{1}{2}}$$

where: D_{jk} = distance between stands j and k

x_{ij}, x_{ik} = density of species i in stand j or k

During clustering the stands were grouped according to Johnson's (1967) "maximum method." In this method of clustering the distance between two clusters is defined as the maximum distance between an observation in one cluster and an observation in another cluster (Barr et al. 1976). This type of clustering tends to produce compact or distinct clusters. "Complete linkage" (Sneath and Sokal 1973) and "furthest-neighbor clustering" (Clifford and Stephenson 1975) are two other terms for this strategy.

Pritchard and Anderson (1971) considered furthest-neighbor clustering to be quite useful in their Scottish vegetation studies. In considering various clustering strategies, Clifford and Stephenson (1975) concluded that it is not easy to predict the effectiveness of a particular method, but that a method may simply be judged by how well it works in each particular case or type of study.

In this research, it was expected that species-composition and species-density would both be important in identifying stand groups. In order for the cluster analysis to identify the density differences, unstandardized density data were used. However, *Lycopodium flabelliforme* created a problem because its density was so much greater than the average plant density that it masked the importance of other species in the two stands where it occurred.

This problem arises from a peculiarity of the Euclidean Distance formula. When unstandardized species data are used, stands with abnormally high species scores may appear dissimilar to stands with similar vegetation and low species scores (Orloci 1967). To correct the severe distortion of the cluster analysis due to L. *flabelliforme*, its density was reduced to one stem per quadrat. This reduction is reasonable because of L. *flabelliforme's* questionable ecological significance in the present study and because it is a highly rhizomatous plant. Its distribution and density are greatly affected by its use as a decoration during Christmas, and thus it is heavily harvested in some areas. Also, because of its rhizomatous growth habit its apparent density greatly exceeds the actual number of plants.

The cluster diagram is illustrated in Figure 2, with the height of each bar corresponding to the Euclidean Distance at each clustering level. Distance is expressed on the left axis as a percent of the maximum distance in the analysis and on the right axis as Euclidean Distance.

In Figure 2, four clusters of stands are evident at the 30 percent distance level. The three major clusters are indicated as Clusters I, II, and III. The fourth cluster is a singleton, stand 4. In terms of absolute density, the clusters are characterized by one or more dominant shrub species as well as subdominant shrubs and herbs (Table 1 and Appendix D). Subclusters within each cluster vary in their proportions of dominants and subdominants.

Cluster I consists of six stands dominated by the strawberry bush, Euonymus americanus. Other important Cluster I species are Cornus florida, Smilacia racemosa, and Mitchella repens. These four species occur at significantly higher densities ($P \leq .10$) in Cluster I than in Clusters II and III. Significance was determined by non-parametric methods. The Kruskal-Wallis one-way analysis of variance by ranks (Daniel 1978) was used to determine whether or not significant differences of the vegetation variables occurred between the clusters. If a significant difference occurred, then a multiple comparisons procedure using rank sums (Daniel 1978) was used to determine the location of the difference between the pairs of clusters.

In Figure 2, Cluster I appears to be composed of two subgroups of three stands each at the 23.3 percent clustering level. These subgroups will be referred to as IA (stands 1,3,19) and IB (stands 6,7,15). The major difference between the two subgroups is a 10 times higher density

Figure 2. Dendrogram from a cluster analysis of herb and shrub densities in 30 stands. Percent of the total Eulidean Distance on the left ordinate, Euclidean Distance units on the right ordinate, and stands are numbered on the abscissa.

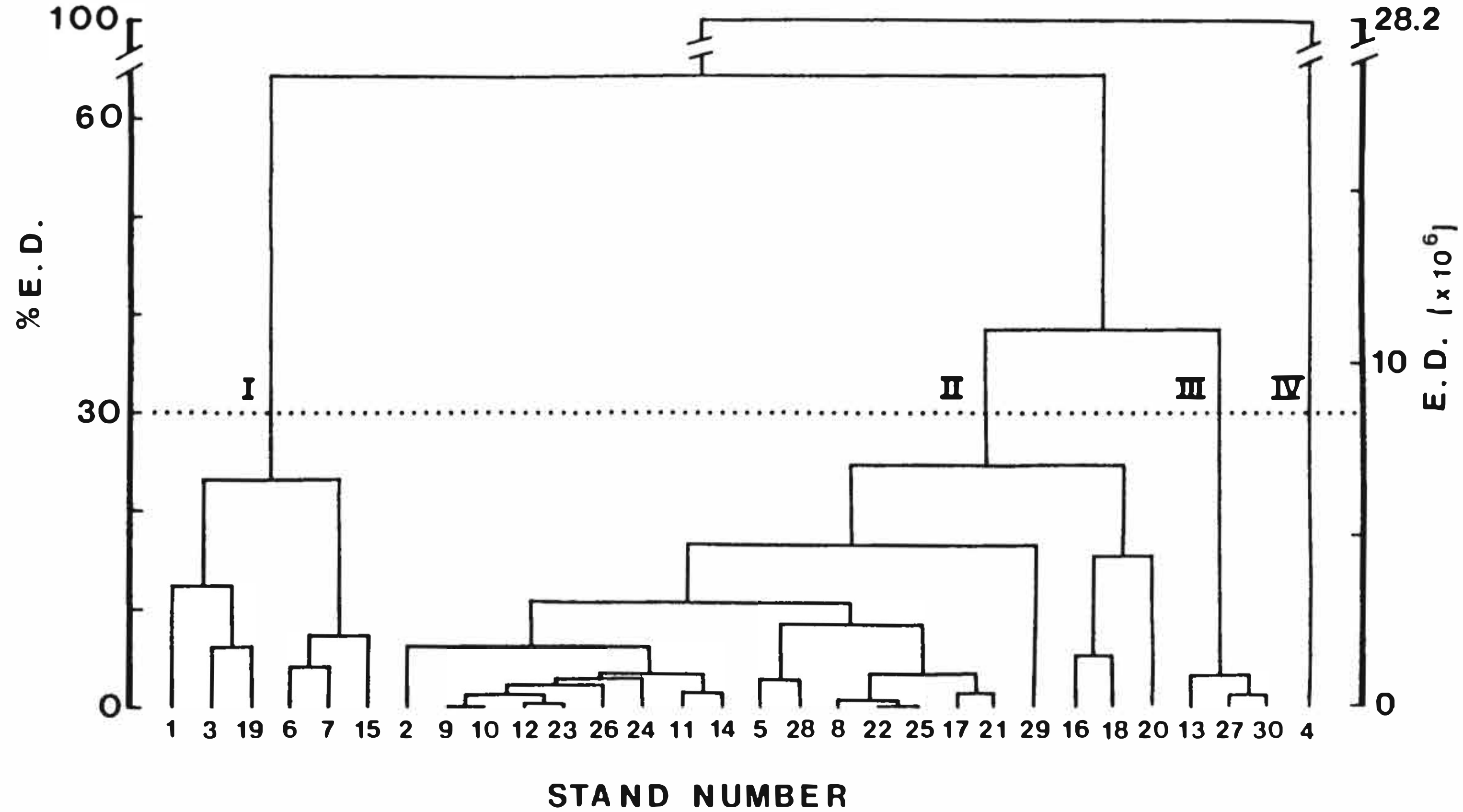

100
60
30
0
% E.D.
28.2
10
0
E.D. (x 10^6)
I
II
III
IV
1 3 19 6 7 15 2 9 10 12 23 26 24 11 14 5 28 8 22 25 17 21 29 16 18 20 13 27 30 4
STAND NUMBER

TABLE 1: Vegetation Characteristics of the Four Clusters.

ATTRIBUTE	STATISTIC	CLUSTER CODE I	II	III	IV
Number of stands	N:	6	20	3	1*
Density, stems/120m^2:					
Euonymus americanus	$\bar{x}$:	329.00[a]	18.85	4.67	0
	s:	135.73	30.00	8.08	
Mitchella repens	$\bar{x}$:	341.50[a]	33.05	0.00	1473
	s:	354.48	78.91	0.00	
Cornus florida	$\bar{x}$:	63.33[a]	21.00	3.67	66
	s:	42.24	31.27	4.73	
Vaccinium vacillans	$\bar{x}$:	90.33[a]	298.15	496.33	121
	s:	135.55	160.76	48.75	
Gaylussacia baccata	$\bar{x}$:	6.00[a]	140.10	739.67	178
	s:	7.38	107.82	135.96	
Smilacina racemosa	$\bar{x}$:	38.67[a]	7.05	0.00	6
	s:	62.81	15.55	0.00	
Herbs (total)	$\bar{x}$:	440.00	139.30	30.00	47
	s:	456.33	196.15	42.51	
Shrubs (total)	$\bar{x}$:	990.00	799.65	1421.67	2039
	s:	323.46	301.37	119.08	
H' (Shannon-Wiener)	$\bar{x}$:	1.984	1.910	1.180	1.211
	s:	0.537	0.402	0.232	
Richness (number of species sampled)	$\bar{x}$:	29.83	20.80	10.67	25
	s:	9.72	7.33	4.73	

* - only one stand is included in Cluster IV so $\bar{x}$ and s cannot be calculated

a - significantly different from Clusters II and III ($p \leq .10$)

of Mitchella repens in IA. The mean density of M. repens is 620.33 in IA and 62.67 in IB.

Five of the Cluster I stands are located in the Coastal Plain and the sixth, number 19, is in the Piedmont 5 km from the western edge of the Coastal Plain. Thus Cluster I is associated with the Coastal Plain.

Cluster II contains 20 stands in which the lowbush blueberry, Vaccinium vacillans is either dominant or codominant with Gaylussacia baccata or Gaylussacia frondosa. The densities of V. vacillans and G. baccata are both significantly greater in Cluster II than in Cluster I ($P \leq .10$). Two major subclusters of closely related stands are present in Cluster II. These clusters are referred to as IIA (stands 2-14 on Figure 2) and IIB (stands 5-21 on Figure 2). Although V. vacillans is a dominant in both subclusters, its density averages 1.8 times higher in IIB than in IIA. G. baccata is more important as a codominant in IIB, where it has a mean density of 226.57 as compared to 79.44 in IIA. Euonymus americanus is present as a subdominant in subcluster IIA but is generally unimportant in IIB.

Subcluster IIC, a single stand (#29) is dissimilar to subclusters IIA and IIB because of the dominant herb Desmodium nudiflorum and the high density of Cornus florida. The D. nudiflorum was quite immature, however, at the date of sampling, May 16, and may have become less dense in June and July when light and moisture stress was more intense. Vaccinium vacillans and G. baccata were present at densities comparable to those in subcluster IIA.

Subcluster IID consists of stands 16, 18, and 20 and is considered a distinct subcluster because of the dominant shrub Gaylussacia frondosa.

Vaccinium vacillans is codominant with G. frondosa in stands 16, and 18, but in stand 20 G. baccata and M. repens are the codominants of G. frondosa, and V. vacillans is of low importance.

Cluster II stands are not associated with either physiographic province. Ten are located in the Coastal Plain and ten in the Piedmont. Likewise the subclusters show no relationship to the physiography.

Cluster III consists of three stands which are highly similar, joining at the 3.3 percent distance level. They are characterized by extremely high densities of V. vacillans and G. baccata and by low or zero density of the important Cluster I and II species. Vaccinium vacillans reaches comparable densities in several Cluster IIB stands, but G. baccata is uniformly more dense in Cluster III stands. These high density shrub species form a continuous heath layer through much of the type III stands. The characteristic low diversity is due mainly to the small number of species per stand which averaged 10.7 in Cluster III as compared with 29.8 in Cluster I and 20.8 in Cluster II. Although Clusters II and III are separated by a large Euclidean Distance (38.5 percent), V. vacillans and G. baccata are dominant shrubs in both clusters. The large distance is an exaggeration caused by great intercluster difference in total shrub density.

Two of the Cluster III stands are in the Piedmont and the other is in the Coastal Plain and the cluster is thus associated with both provinces.

Cluster IV consists of only one stand (#4) located in the Coastal Plain, and is the most dissimilar stand in the analysis because of the extremely high density of Mitchella repens. Its density is more than eight times that of the next most abundant species in the stand.

Again, the Euclidean Distance is exaggerated because of the unstandardized density data. Other important species in this stand are *V. vacillans* and *G. baccata* which are present at densities similar to those in subcluster IIA.

Stand-wise cluster analysis is a useful technique for quantifying the relatedness of plant communities. However it does not provide a clear map of the species compositions that were used to determine the degree of similarity or dissimilarity. In addition, the agglomeration process tends to deemphasize the importance of the less abundant species. For both of these reasons it becomes necessary to examine the species data for evidence of species-interrelationships. This analysis is presented in the following section.

2. Species Association

Kendall's tau coefficient was used to determine whether there was significant stand by stand association between species which were present in three or more stands. These 55 species and their stand densities are listed in Table 2, with the stands in the order resulting from the cluster analysis. Kendall's coefficient is a suitable statistic for use with plant densities because as a rank coefficient it does not give "undue weight to extreme values" (Greig-Smith 1964). It is also suitable for these data because it is a nonparametric coefficient, and the distributions of the species densities are suspected of being non-normal and the variances suspected of being unequal.

The correlation matrix (Table 3) has been arranged to show a group of 27 species (#1-27) which have a large number of

Table 2. Total absolute densities of the 55 species which occurred in three or more stands. The stand sequence was determined by the cluster analysis (refer to species codes in Appendix C).

	CLUSTER I													CLUSTER II	
Stand Number	1	3	19	6	7	15	2	9	10	12	23	26	24	11	14
Species Code:															
AVIR	109						29			5					
MRUB			1	8											
CCAN	4			6	7										
VPAP	1	2	12	9						4					
PPEL	9			19	1										
LBEN	8						2								
RARG	1		25		1										
POTA	1	3	31	2											
GPUB	4		13	2			4					14	1		
PALB	3		6	1								2	5		
GCIR	66	2	10	263								22			
GCAN	1		2	20								6			
PACR	7	4	3			1				5		18			
SRAC	116	33	1		2	19				27			1		
MREP	327	722	662	45	143		313								
SCAE	54	2	160		3	13			2	8		26	4		1
GRAX	223	18	122	16				5	1			35	70		
DVIL	38		10							2		12	13		
EAME	239	267	569	377	536	364	89	18	44	39	9	91		1	
CFLO	76	37	46	144	35	42	2	77	18	13	2	60	26	9	8
CARX	10	2	112					3		9	25	82	116		
CPUM			1	2	12	29		4	1		1	10			
CMAC	19	1	22	15	2	16	4	2	13	9		58	7	11	13
PAWX	205	4	8	15			2	1				56	6		
UPER			101	23											22
PBIF	155	4	90		3	1	8	8	3	13	2	29	10		2
DPAN	1								4	2	1	1			1
VACE			6					9				52	58		
DNUD	13	27	67	50	1	35	7	5	4	34	6	136	5		1
LLIG			14			29	17			1	1	2	37		1
VATR				3	3	2				7					1
VDEN								2			31	25			
CALN		5													
IVER			5			1					10		3		
ISOV			1									1	10		
CVER												5	2		
SELI												5	2		
PANX				3								32	69	3	14
VCOR	1														
SARB				9							8	2	19		
TPAL	51	20								10	70			5	
HHYP			7									1		16	
CUNI			1												
LQUA											25	5	108		
VPRU								2		2		9			
CACA									3						3
CVIR						4		1	7	8					
GFRO		51				9		5						168	
RNUD	40	2				64	18			102	120	33	42	112	111
AARB		13				2				3	8	5	3		1
SALB				8	15	5		5	18	7	20	15	29	3	14
LMAR											1				
VSTA		4	7	28	22	31	1	45	50	21	8	28	72	72	104
VVAC	27	29	75	19	24	368	223	315	271	214	199	155	268	120	139
GBAC		14	6			16	33	14	44	21	106	34	163	133	211

	CLUSTER II											CLUSTER III			CLUSTER IV
Stand Number	5	28	8	22	25	17	21	29	16	18	20	13	27	30	4
Species Code:															
AVIR			12												
MRUB															1
CCAN															
VPAP					1			31							
PPEL															
LBEN								4							
RARG	7													1	
POTA							2			1					
GPUB					2			1							
PALB							1								2
GCIR										25					
GCAN					5			5							
PACR															2
SRAC										1					1
MREP	65		91				21				171				1473
SCAE		23			8		3	65		1					6
GRAX	151		4	11	25		45	6	2	19	57	16			4
DVIL		18			15			1							
EAME		12					62			1	11	14			
CFLO	5	70		12	4	3	1	107		3			2	9	66
CARX				8	2		40					32			
CPUM					2			7							2
CMAC	89	28	4	4	7		59	31		5		4			12
PAWX		2						1		2					3
UPER															
PBIF	9	28		4	3	3		10				6			18
DPAN															
VACE															5
DNUD		44			1	3	3	498							6
LLIG	38			10	20		33								1
VATR										5					13
VDEN		7		16	4					6	33				13
CALN									53	107					
IVER				3						3					
ISOV							11					1			
CVER	5														
SELI												1			
PANX	2		6	7								23			
VCOR				2			2			5	46				
SARB	2			6					3		31				
TPAL				15											
HHYP	2		11				3		3						
CUNI		1													4
LQUA		36		1			17			2				3	
VPRU		3													
CACA		1					17			18	8			8	
CVIR		3			7	4		31				1		1	
GFRO	5					132			386	370	509			2	
RNUD	5		209	119	229	10			51			90		15	
AARB		14	1	4	8	12	3		38	34	12		7	7	
SALB	52	4	7	2	7	31	29	13	10	83	3	18	4	14	13
LMAR							7		9			18			
VSTA	102	17	7	20	83	26	16	36	78	119	57	23	180	127	133
VVAC	572	561	311	232	210	370	423	208	680	408	84	542	445	502	121
GBAC	170	66	226	267	257	324	258	34	268	12	103	614	721	884	178

Table 3. Kendall's tau correlations ($P \leq .10$) for the 55 herb and shrub species which occurred in three or more stands. The species are arranged to show groups of species which have similar positive (+) or negative (-) correlations (refer to species codes in Appendix C).

	1 AVIR	2 MRUB	3 CCAN	4 VPAP	5 PPEL	6 LBEN	7 RARG	8 POTA	9 GPUB	10 PALB	11 GCIR	12 GCAN	13 PACR	14 SRAC	15 MREP	16 SCAE	17 GRAX	18 DVIL	19 EAME	20 CFLO	21 CARX	22 CPUM	23 CMAC	24 PAWX	25 UPER	26 PBIF	27 DPAN	28 VACE
1 AVIR																												
2 MRUB																												
3 CCAN		+																										
4 VPAP		+	+																									
5 PPEL			+	+																								
6 LBEN	+			+																								
7 RARG		+	+	+		+																						
8 POTA		+	+	+	+		+																					
9 GPUB		+	+			+	+																					
10 PALB		+	+		+		+		+																			
11 GCIR		+	+	+	+	+	+	+	+	+																		
12 GCAN		+	+	+	+		+	+	+	+	+																	
13 PACR	+		+	+	+			+																				
14 SRAC							+		+				+															
15 MREP	+	+	+		+	+	+			+	+		+															
16 SCAE			+	+				+	+			+	+		+													
17 GRAX			+	+			+	+	+			+			+													
18 DVIL			+	+			+		+	+	+		+	+		+	+											
19 EAME			+	+	+			+		+	+		+	+	+	+												
20 CFLO		+	+	+	+		+		+	+	+	+	+	+		+		+	+									
21 CARX								+	+	+			+	+		+	+	+										
22 CPUM						+			+			+							+	+								
23 CMAC		+	+	+			+		+	+	+	+		+		+	+	+		+								
24 PAWX		+	+	+	+			+	+			+	+	+		+	+	+		+	+		+					
25 UPER		+	+	+				+	+			+											+					
26 PBIF				+		+	+		+			+	+	+		+	+	+		+	+		+	+				
27 DPAN		+	+	+				+	+	+	+	+	+	+		+		+	+	+		+	+	+		+		
28 VACE									+	+				+			+	+		+						+	+	
29 DNUD																+					+						+	
30 LLIG																					+	+						
31 VATR																												
32 VDEN																								+				
33 CALN								+																				
34 IVER										+											+							
35 ISOV										+							+				+		+					+
36 CVER									+	+							+						+					
37 SELI									+	+							+				+		+			+		
38 PANX																												
39 VCOR								+									+				-							
40 SARB																												
41 TPAL													+															
42 HHYP																												
43 CUNI										+			+	+	+					+				+		+	+	+
44 LQUA				-											-						+							
45 VPRU															-			+		+			+			+	+	+
46 CACA									-									-		-				-	-	-		
47 CVIR								-		-					-													
48 GFRO									-			-			-		-				-		-			-	-	
49 RNUD		-					-								-						-							
50 AARB		-	-		-	-	-													-		-	-					
51 SALB	-		-	-											-	-												
52 LMAR																				-				-		-		
53 VSTA	-		-	-		-		-			-		-		-	-			-		-						-	
54 VVAC		-	-	-	-	-		-	-	-	-	-	-	-	-	-			-	-		-		-	-		-	
55 GBAC		-	-	-	-	-		-	-		-	-	-	-	-	-				-	-			-		-	-	

	29 DMUD	30 LLIG	31 VATR	32 VDEN	33 CALN	34 IVER	35 ISOV	36 CVER	37 SELI	38 PANX	39 VCOR	40 SARB	41 TPAL	42 HHYP	43 CUNI	44 LQUA	45 VPRU	46 CACA	47 CVIR	48 GFRO	49 RNUD	50 AARB	51 SALB	52 LMAR	53 VSTA	54 VVAC	55 GRAC
30 LLIG																											
31 VATR																											
32 VDEN																											
33 CALN																											
34 IVER		+																									
35 ISOV		+																									
36 CVER							+																				
37 SELI	+							+																			
38 PANX							+	+	+																		
39 VCOR				+																							
40 SARB		+		+		+		+																			
41 TPAL		+				+		+				+															
42 HHYP			−				+			+																	
43 CUNI																											
44 LQUA				+		+	+	+	+																		
45 VPRU																											
46 CACA											+					+											
47 CVIR														+			+										
48 GFRO					+		−																				
49 RNUD		+												−	−												
50 AARB				+	+											+											
51 SALB								+								+											
52 LMAR							+													+	+						
53 VSTA																				+							
54 VVAC																+		+				+	+	+			
55 GBAC																+				+		+		+	+	+	

positive correlations among themselves at the .10 or smaller level of significance. There are 189 positive correlations of a possible 351. The group included Euonymus americanus, Cornus florida, and Mitchella repens which are characteristic of Cluster I stands. Thirteen of the 27 species were positively correlated with E. americanus and 20 were negatively correlated with Vaccinium vacillans, the dominant in Clusters II and III. These floristic correlations support the distinctness of Cluster I stands as suggested by the dominant species' density alone.

Several species were positively correlated with V. vacillans and/or G. baccata which means that these interrelated species are consistent members of the stands in Clusters II and III. These additional species were Gaylussacia frondosa, Sassafras albidum, Amelanchier arborea, Vaccinium stamineum, Cypripedium acaule, and Lysimachia quadrifolia.

Thus, the floristic correlations coincide with the classification of the cluster analysis. However, even the character species such as E. americanus and V. vacillans are not exclusively found only in their clusters but should be considered as favorably associated. That is, they are both commonly found in Clusters I and II, but E. americanus is abundant only in Cluster I and V. vacillans is mainly abundant only in Clusters II and III.

3. Soils

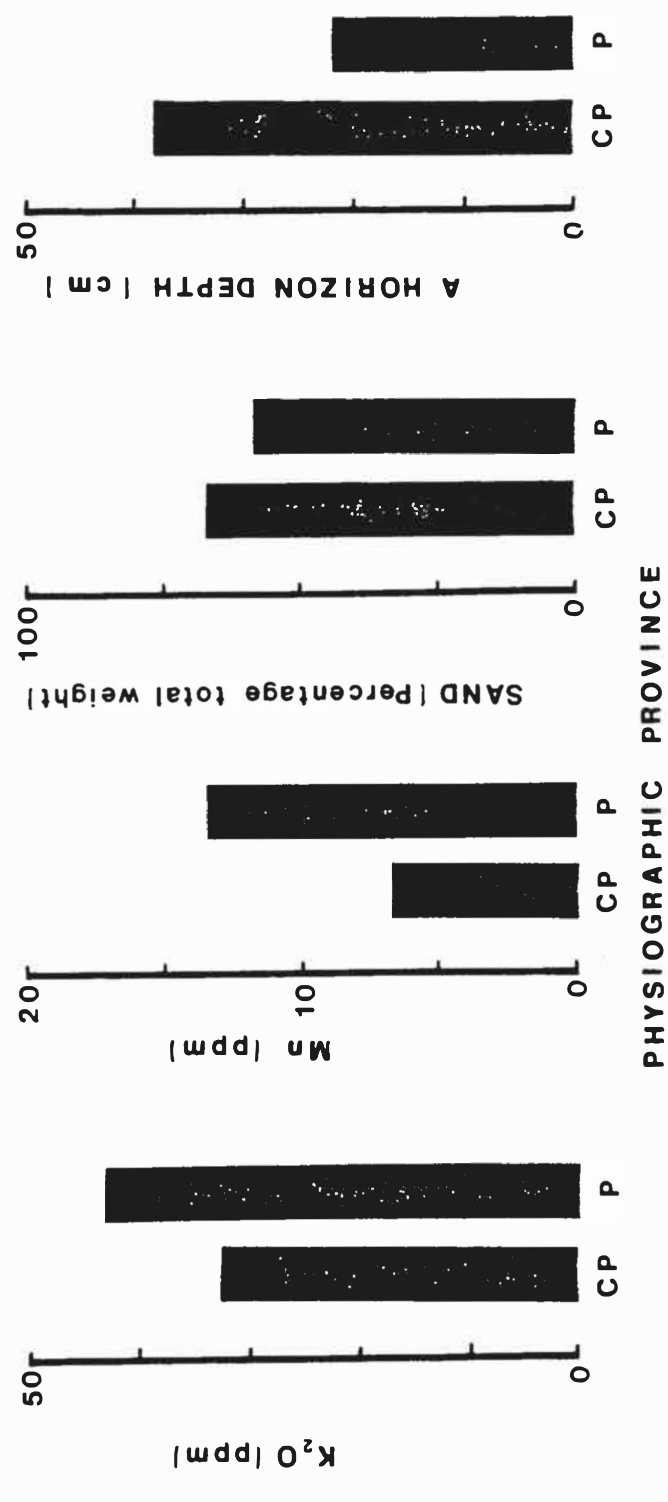
The soil measurements from topographic high and low areas of all stands (Appendix B) were averaged before analysis, except in stands 24 and 29. Generally there was little variation in soil measurements between the topographic areas within each stand except in stands 29 and 24. The low area soil in stand 29 was affected by agricultural runoff, and the soil in stand 24 was severely disturbed by logging, so that in both stands only the upland value was used. Further explanation is provided in Appendix E. The stand averages (Appendix B) were compared between the physiographic provinces (Fig. 3, Table 4) and also between the clusters (Fig. 4).

Significant differences in potassium, manganese, percent sand, and depth of the A horizon were found between the two physiographic provinces ($P \leq .10$) using the Kruskall-Wallis analysis of variance (Daniel 1978).

The sand percentage averaged 67.5% in the Piedmont province. A higher sand percentage was expected in the Coastal Plain because the parent material is sedimentary. This amount of sand is normal for sandy loam soils, but several stands had soils composed of greater than 80 percent sand. These sandy soils were found in the fall zone uplands, and in the low drainage areas of Coastal Plain stands. Soils with less that 50 percent sand were found in two stands with Nason and Tatum silt loam soils.

The depth of the A horizon was significantly greater in the Coastal Plain at an average of 38.6 cm as compared to 22.1 cm in the Piedmont. The deepest A horizon was found in stands 9 and 10 in the western Coastal Plain, which had a thick surface phase soil that was deeper than 61 cm, the deepest measurement possible with the sample technique. The shallowest A horizon was in stand 21 where 10 cm was the average depth. The difference in depth between the provinces is partially due to the steeper Piedmont terrain which results in more

Figure 3. Histograms of soil variables that are significantly different ($P \leq .10$) between the physiographic provinces. "CP" represents Coastal Plain and "P" represents Piedmont.



K$_2$O (ppm)
50
0
CP
P
Mn (ppm)
20
10
0
CP
P
SAND (Percentage total weight)
100
0
CP
P
A HORIZON DEPTH (cm)
50
0
CP
P
PHYSIOGRAPHIC PROVINCE

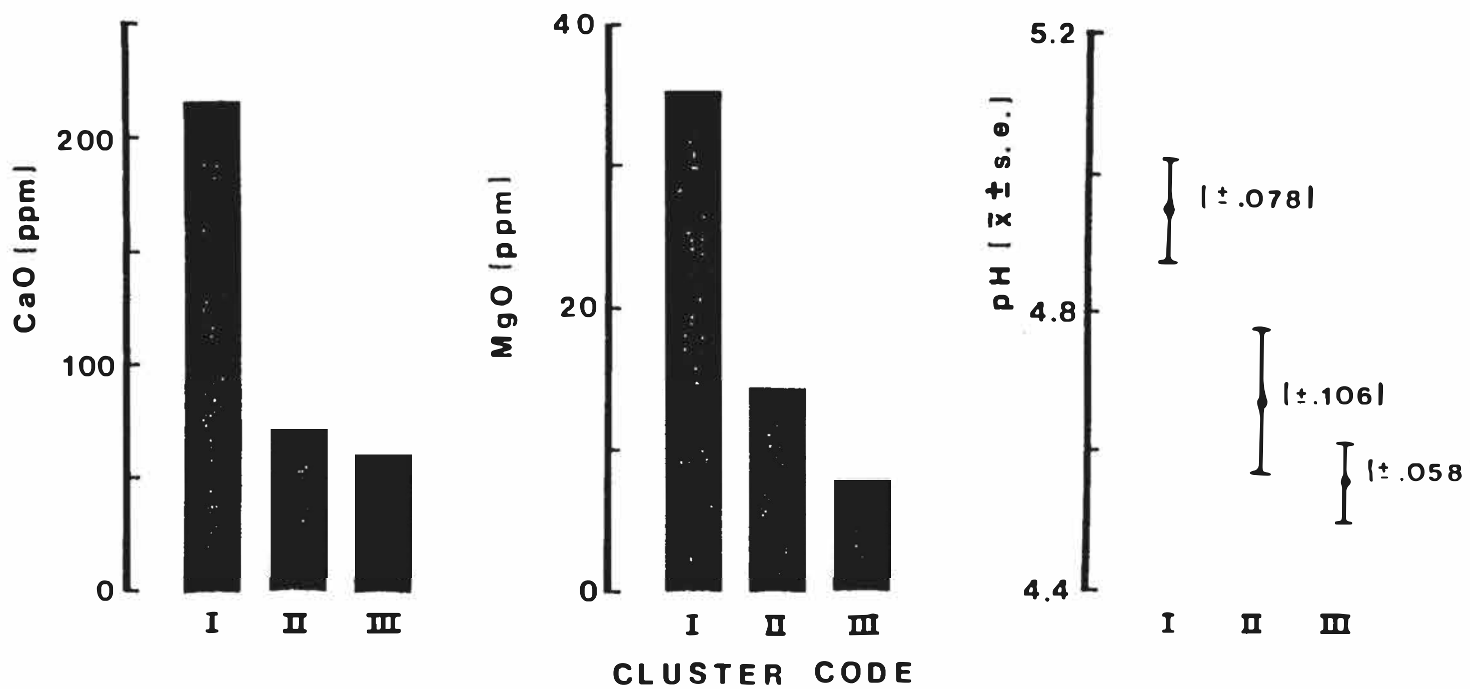
TABLE 4: Means and Standard Deviations of Soil Variables for the Physiographic Provinces and for the Clusters.

		Coastal Plain	Piedmont	Cluster I	Cluster II	Cluster III
CaO	$\bar{x}$ =	110.74	82.54	214.67[b]	70.82	61.33
ppm	s =	111.45	40.66	155.29	10.85	9.81
MgO	$\bar{x}$ =	15.97	20.08	35.50[b]	14.28	8.00
ppm	s =	12.26	17.38	22.79	7.50	2.00
pH	$\bar{x}$ =	4.70	4.76	4.95[b]	4.67	4.58
	s =	.35	.17	.35	.26	.10
P_2O_5	$\bar{x}$ =	5.28	3.12	5.58	4.13	4.08
ppm	s =	3.38	1.49	3.99	2.52	3.74
K_2O	$\bar{x}$ =	32.80	43.04[a]	43.33	36.51	34.50
ppm	s =	9.60	7.99	10.26	10.14	7.05
Mn	$\bar{x}$ =	6.85	13.51[a]	12.34	9.23	7.13
ppm	s =	4.46	3.12	4.13	5.63	1.39
Zn	$\bar{x}$ =	1.16	1.28	1.39	1.16	1.28
ppm	s =	.27	.30	.36	.27	.03
%	$\bar{x}$ =	2.08	2.10	2.07	2.09	2.27
OM	s =	.40	.42	.59	.36	.21
%	$\bar{x}$ =	67.50	58.58	64.17	63.72	60.17
Sand	s =	8.75	8.76	3.86	10.86	13.19
A	$\bar{x}$ =	38.56[a]	22.07	33.50	30.57	35.33
Horiz. cm	s =	11.79	9.53	12.05	14.99	13.28

a - significantly different ($P \leq .10$) between physiographic provinces

b - Cluster I value is significantly different ($P \leq .10$) from the values in Clusters II and III

Figure 4. Histograms of soil variables that are significantly different (P≤.10) between the three major vegetation clusters.


CaO (ppm)
200
100
0
I
II
III
MgO (ppm)
40
20
0
I
II
III
CLUSTER CODE
pH ($\bar{x}$ ± s.e.)
5.2
4.8
4.4
(±.078)
(±.106)
(±.058)
I
II
III

severe erosion of the organic matter.

Potassium concentrations were 31% higher in the Piedmont stands at a mean of 43.0 ppm compared to 32.8 ppm in the Coastal Plain which was a significant difference ($P \leq .10$).

The micronutrient, manganese, also averaged higher in the Piedmont at 13.5 ppm compared with 6.8 ppm in the Coastal Plain. Even the lowest manganese concentration is considered sufficient for plant growth, although the critical deficiency level depends on the soil pH. Deficiency is most common in neutral or basic soils where manganese is less soluble, but deficiencies may also occur in acid, sandy soils because of leaching. The maximum manganese measurement possible by the VPI & SU soil laboratory technique is 16 ppm. Toxicity occurs at concentrations of over 200 ppm (Donohue, personal communication). Thus, although certain of the manganese concentrations are underestimated, manganese was probably not present at toxic levels. Overall the manganese concentrations of soils in Clusters I, II and III are statistically equivalent. In the Coastal Plain alone however, Cluster I concentrations were significantly and consistently higher than the remaining stands at a mean of 11.6 ppm in comparison to 4.9 ppm for the non-Cluster I stands.

Calcium and magnesium amounts were significantly greater in Cluster I stands that in Clusters II and III and the pH was also significantly higher (Fig. 4). Calcium (CaO) averaged 214.7 ppm in Cluster I, 70.8 ppm in II and 61.3 ppm in III. Although calcium is a necessary plant nutrient, it is such a common soil component that it is rarely deficient. However it is important in that its presence is tied to the soil pH, and also some plants, collectively described as "calcifuges" grow only where calcium is present at low concentrations. As expected, calcium levels were highest in stands 1 and 6 where shell deposits were evident in the soil substrata. Calcium levels varied more in the Coastal Plain where the coefficient of variation between stands was 1.01 compared with 0.49 in the Piedmont.

Magnesium (MgO) concentrations in the individual stands ranged from 6.85 ppm which are considered low-minus to medium amounts. Cluster I had significantly higher concentrations with a mean of 35.5 ppm compared with 14.3 ppm in II 8.0 ppm in III. Deficiencies of this element to some plant species are possible when it is found at concentrations lower than 36 ppm.

The soil pH ranged from extremely acid (pH 4.2) to medium acid (pH 5.6), which is the expected pH range for these soils (USDA unpublished, USDA 1976, VPI & SU n.d.) The test values correspond to the expected values even though the soils were stored for one to two months prior to the pH measurement. The average pH was higher in Cluster I at 4.95 compared to 4.67 in II and 4.58 in III. Soil pH is affected by a variety of factors including calcium concentration and stand vegetation and its major effect is on nutrient availability to plants (Thompson and Troeh 1973). Moderately acid to neutral soils are usually considered most favorable for plant growth, although some plants are favorably affected by strongly acid soils.

Organic matter, phosphate, zinc, and nitrate showed no significant association with either the physiographic provinces or the vegetation clusters. The organic matter percentage ranged from 1.5% to 3.4 %. Phosphate (P_2O_5) was consistently low with a mean concentration of 4.34 ppm. Zinc was present at variable concentrations ranging from

3.4 ppm to 0.5 ppm. It was possibly deficient in four Coastal Plain stands which had concentrations of 0.8 ppm or less. This concentration is considered deficient for some agricultural crops of the Poaceae family such as corn and small grains (VPI & SU 1978). Like manganese, however, zinc deficiency is most common in basic soils where its solubility is low. Because the forest soils sampled were acidic, sufficient zinc may have been available to the plants even at low concentrations.

Nitrate was not present in measurable levels in any of the samples. It is a soluble form of nitrogen and is quite easily leached from the soil (VPI & SU 1978). Thus it is usually present at concentrations less than 5 ppm, which were not measurable and essentially unavailable to plants (Donohue, personal communication). Thus, other forms of nitrogen are normally utilized by the plants.

4. Soil and Plant Density Relationships

The densities of the 15 most common taxa in the analysis (total density >350) and the stand averages of the soil variables were statistically compared using Kendall's tau correlation coefficient (Table 5). In these correlations, the strongest and most numerous were with calcium (CaO), magnesium (MgO), and pH. In Table 5, seven of the 15 taxa plus diversity and herb density were positively associated ($P \leq .05$) with CaO. Four of the 15 taxa were negatively correlated with CaO. In most cases the same species were similarly associated with MgO and pH also. The negative correlations were with the *Vaccinium* and *Gaylussacia* species.

The large number of species correlations with CaO, MgO, and

TABLE 5. Kendall's tau Correlations for Soil and Plant Data.

SHRUBS	CaO	MgO	pH	P_2O_5	K_2O	Mn	Zn	%OM	% Sand	A Horiz.	H'(Diversity Shannon-Wiener)	Richness No. of Species
Euonymus americanus	+++ .43	+++ .36					+ .25					+ .29
Cornus florida	+++ .53	++ .28	+++ .41			++ .29		- -.25				+++ .40
Mitchella repens								- -.24				
Sassafras albidum												
Rhododendron nudiflorum				+ .26				+++ .42				
Gaylussacia baccata	--- -.49	--- -.45	- -.24					+ .24			-- --.31	--- -.42
G. frondosa	-- -.31		-- -.30	- -.25								
Vaccinium stamineum	--- -.39	-- -.30									- -.21	- -.24
V. vacillans	--- -.42	--- -.38	--- -.38			-- -.27					-- -.26	- -.30
Total Shrub Density				--- -.41					- -.22			

TABLE 5. <u>Continued</u>.

HERBS	CaO	MgO	pH	P_2O_5	K_2O	Mn	Zn	%OM	% Sand	A Horiz.	H' (Diversity Shannon-Wiener)	Richness No. of Species
Polygonatum biflorum	+++ .39							-- -.27				
Smilacina racemosa	+++ .52	+++ .48	+++ .36		+++ .35	+++ .34		-- -.28		-- -.27	++ .31	++ .56
Galium circaezans	+++ .63	+++ .45	+++ .39		++ .31	++ .32					+++ .39	+++ .53
Unknown Poaceae spp.			++ .26						-- -.31		+++ .41	+++ .46
Carex spp.	++ .30	+++ .39	++ .31		++ .29	++ .26					+++ .42	+++ .47
Desmodium nudiflorum	+++ .55	+++ .48	++ .32	+ .25	++ .32	++ .28					+++ .36	+++ .57
Total Herb Density	+++ .43	+++ .47	++ .31		+++ .38	++ .28				- -.23	+++ .61	+++ .71
Diversity H'(Shannon-Wiener)	++ .31	+++ .51	++ .26		+++ .45	++ .26				- -.22		+++ .59
Total Density				-- -.30					--- -.33			

+ or - $P \leq .10$

++ or -- $P \leq .05$

+++ or --- $P \leq .01$

pH emphasizes the important influence that these soil variables have on the vegetation. Although CaO, MgO, and pH are significantly higher in Cluster I, correlation with these variables alone does not absolutely determine the cluster affinity of the species. Mitchella _repens_, for example, is an important subdominant in Cluster I, but shows no association with the three soil variables, whereas _Polygonatum biflorum_ is positively correlated with CaO but has a similar mean density in all clusters.

Potash (K_2O) and manganese (Mn) were positively correlated with four of the herbaceous taxa, _Smilacina racemosa_, _Galium circaezans_, _Carex_ spp. and _Desmodium nudiflorum_, and also Shannon-Wiener diversity (Peet 1974) and herb density. Mn was also positively associated with _Cornus florida_ and negatively associated with _Vaccinium vacillans_. All of these taxa and characteristics were also correlated with CaO, MgO, and pH.

K_2O and Mn were significantly higher in Piedmont stands so that the correlations superficially indicate an association of these taxa with the Piedmont. However, although K_2O and Mn concentrations average lower in the Coastal Plain, the highest values in the Coastal Plain are found in the Cluster I stands at concentrations comparable to the Piedmont stands. Since these species are correlated with "Cluster I" nutrients and also K_2O and Mn, it is probable that the species are related to Cluster I more strongly than to the Piedmont province.

The organic matter percentage was related to the density of several species. It was positively correlated with _Rhododendron nudiflorum_ and _Gaylussacia baccata_, and negatively correlated with

Cornus florida, *Mitchella repens*, *Polygonatum biflorum*, and *Smilacina racemosa*. Thus there is some tendency for Cluster I species to be more abundant where the soil has lower amounts of organic matter. The reverse is true of Cluster II and III species.

The percentage of sand in upland soils is inversely related to soil moisture availability. Negative correlations occurred between the sand percentage and unknown Poaceae spp., shrub density, and as expected total plant density.

Phosphate (P_2O) was positively correlated with *Rhododendron nudiflorum* and *Desmodium nudiflorum*, and negatively correlated with *Gaylussacia frondosa*, shrub density, and total plant density.

Zinc was positively correlated with *Euonymus americanus*.

DISCUSSION

Most of the upland deciduous stands of the Coastal Plain are quite similar to stands of the Piedmont in terms of herb and shrub vegetation. In the twenty-three stands of Clusters II and III, Vaccinium and Gaylussacia dominate the shrub stratum, and variation in subdominant species of these stands shows little relation to the physiography.

However, five of the six Cluster I stands where Euonymus americanus is dominant are located in the Coastal Plain. These unique stands are shown to have significantly higher amounts of calcium, and magnesium in the top 15 cm of the soil and a less acidic pH than other stands in the analysis. Calcium-rich soil in the Coastal Plain is often due to the presence of shell deposits in the sedimentary soil substrata. I found these shells at the soil surface in two of the Cluster I stands.

Harvill et al. (1977) mention a distinct vegetation type associated with marl (shell deposit) areas which they call the "Beech-Maple-Tuliptree forest." The forests in my research where E. americanus was a dominant shrub were a mixed hardwood type and may correspond to the forest described by Harvill et al. (1977).

Euonymus americanus is a characteristic shrub of mesophytic forests in the Oak-Pine Forest region (Braun 1950), and is also characteristic of the Southern Mixed Hardwood Forest (SMHF) described by Quarterman and Keever (1962). Ware (1970) found E. americanus to be an abundant shrub in a Coastal Plain forest in Virginia which he considered to be a part of the SMHF. It is possible that the Cluster I stands in this analysis are similar to the SMHF because they apparently have a mixed hardwood composition and they are primarily a Coastal Plain vegetation type.

In Moore County, North Carolina, Sechrest and Cooper (1970) found the relative percent cover and density of shrubs to be greater in the Piedmont than in the Coastal Plain. Higher importance of shrubs, which were mainly Vaccinium and Gaylussacia species, was associated with a higher concentration of bases (Ca^{+2},Mg^{+2},K^{+}) in the Piedmont soils. The Coastal Plain soils contained a higher percentage of sand and consequently were more highly leached of these bases.

In my research however, I found that Gaylussacia and Vaccinium were negatively correlated with calcium and magnesium. Shrub density was not significantly greater in either province, neither were calcium nor magnesium concentrations significantly different. However the sand percentage of Coastal Plain soils was slightly (8.8%) higher and the concentration of potassium was lower than in Piedmont soils.

Vaccinium spp. have been shown to be less abundant on calcium rich soils than on the acidic soils of Piedmont North Carolina (Dayton 1966). The relationship of plants of the Ericaeae with soils low in calcium merits them the title, calcifuge. However the relationship of calcifuges to low calcium soils is quite complex and only partly understood (Bannister 1976). In general, calcifuges are able to physiologically tolerate low calcium, low phosphorus, and high aluminum concentrations in soils. However, most calcifuges require a high iron supply in the soil (Etherington 1975).

I found the more important ericaceous shrubs to be Gaylussacia baccata, G. frondosa, Rhododendron nudiflorum, Vaccinium stamineum, and V. vacillans. Gaylussacia baccata and V. vacillans usually had the highest densities in Cluster II and III stands. Generally, V. vacillans is an important component of the Oak-Pine Forest shrub vegetation as described by Braun (1950). She describes some areas as having a nearly continuous heath layer consisting of Gaylussacia and Vaccinium which may be the vegetation type represented by Cluster III in this analysis.

Gemborys (1974) also found Vaccinium spp. (which may have included Gaylussacia spp.) to be dominant shrubs in the xeric uplands of Prince Edward County in the southern Virginia Piedmont. These shrubs were common in the more mesic upland stands but not considered dominant.

In the Coastal Plain in Virginia, Vaccinium spp. were reported to be important shrubs in the College Woods, but were not abundant enough to be considered dominants (Ware 1970).

The water-related adjectives "xeric" and "mesic" are often used in the site descriptions for vegetation types and individual species. Radford et al. (1968) list the shrubs V. vacillans, V. stamineum, G. baccata, and G. frondosa as being characteristic of xeric forests. The percentage of sand in the soil is related to the amount of water available to plants in upland areas. I found, however, the sand percentage was not positively correlated with the densities of the above shrub species, but only showed a negative correlation with the density of the Poaceae spp., shrub density and total plant density (see Table 5). However, the positive correlations with nutrients were much stronger than the three negative sand/moisture correlations. Gemborys (1974) did not test for sand content, but he found similarly strong nutrient correlations farther south in Virginia. My results and Gemborys' (1974), thus suggest that the nutrient gradient may be more influential on the Virginia forest vegetation than the moisture gradient. Although upland stands with lush understory and herb growth are often called "mesic" and stands with a sparse understory and a predominance of ericaceous shrubs are called "xeric", in Virginia these differences may actually be due to nutrient differences and not moisture differences.

Herb density was positively correlated with calcium, magnesium, pH, potassium, and manganese, and this herb-nutrient correlation was expected. Sechrest and Cooper (1970) found a greater proportion of herb species in better sites than in poor sites. Trimble and Weitzman (1956) related herb cover with site quality and found the greatest proportion of herbs on the best sites, fewer herbs on medium-quality sites, and sparse herbs with few species on poor sites. I found, however, that herb densities were extremely variable within the clusters and therefore on the average were not significantly different between clusters. From the herb-nutrient correlations, however, one would expect (and finds) the greatest herb densities in stands with high base status such as in Cluster I.

Trimble and Weitzman (1956) also found that shrub cover varied inversely with site quality. The same results were obtained in the North Carolina studies of Sechrest and Cooper (1970) and Nemeth (1968). I found that the shrub-site quality relationship was not clearcut based on density data, however. Shrub density was negatively correlated only with phosphate and percent sand. However in the sites with higher calcium and magnesium concentrations Euonymus americanus was dominant and its density was comparable to that of the ericaceous shrubs on the poorer sites. Because the cover per stem of E. americanus was much less than that of the ericaceous shrubs it was inconspicuous in comparison, even at high densities. Thus, subjectively it appears that shrub cover was least in Cluster I where E. americanus was dominant, greater in Cluster II stands where ericaceous shrubs were dominant, and greatest in Cluster III stands where there was a dense heath layer.

Species diversity has also been associated with soil nutrients. Buell et al. (1966) studied upland forests in northern New Jersey and found that tree species were often most diverse in stands located in limestone regions with fertile soil. They found that stands with low diversity were often ridgetop stands with poor soils and unfavorable climatic conditions.

In Virginia, total understory diversity was similarly related to soil nutrients being positively correlated with calcium, magnesium, pH, potassium, and manganese. These correlations with diversity appear to be partly a consequence of the variation in total herb density which was also correlated with the aforementioned soil qualities.

The study location of the present research north of the James River was included by Braun (1950) in the Oak-Pine Forest region. She thus considered the vegetation of the two involved physiographic regions to be similar despite the soil and climatic differences, which is in agreement with my results. However, she designated the Coastal Plain south of the James River as a part of the Southeastern Evergreen Forest region. More variation in vegetation could therefore be expected south of the James where the boundaries of the vegetation regions and the physiographic provinces coincide, and in the future a more detailed vegetation analysis south of the James River could be of benefit.

In Moore County, North Carolina, the Coastal Plain soils are sandy loams in contrast to the silt loams and silty clay loams of the Piedmont (Sechrest and Cooper 1970). The sandier soils of the Coastal Plain are leached of their cations and therefore nutrient-poor in comparison to the Piedmont soils. Thus the vegetation of the two provinces differed in North Carolina. In Virginia however, the soils in both provinces were found to be sandy loams. The similar interprovince soil texture in Virginia leads to the development of a similar nutrient status and, therefore, vegetation. However, within each province, the Coastal Plain especially, the vegetation was greatly different between stands with appreciably different calcareous substances. These soil conditions are so important that they mask any interprovince vegetation differences due to climatic factors.

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APPENDIX A

A list of stand locations from east to west grouped by county, including information on soil series if known, aspect and estimated steepness of sampled slopes, and apparent forest type.

New Kent County

1. Mixed hardwood forest at Chesapeake Corporation of Virginia Nature Trail, on southeast side of rt. 33, two miles northeast of I-64, West Point exit. Multiple soil strata. North facing slopes and flat low area from 2 to 25 percent. Marl deposits present.

2. Beech forest along powerline north of rt. 620, ¼ mi west of rt. 632 junction near Barhamsville. Multiple soil strata. Slopes 7 to 25 percent, northeast facing.

3. Mesic oak forest on north side of rt. 249, 2 mi east of New Kent Courthouse. Soil possibly Sassafras and Kempsville series. Slopes 7 to 15 percent, east and west facing.

4. Oak forest south of rt. 249, ¼ mi west of New Kent Courthouse. Soil possible Sassafras series. Level, 0 to 2 percent slope.

5. Oak forest on west side of Schiminoe Creek, and on south side of fire road. Located 3/8 mi southeast of I-64, rt. 609 junction. Soil series possibly Sassafras. Slopes from 2 to 15 percent, north and south facing.

6. Mixed hardwood forest near Tunstall on north side of rt. 606, 1 mi northwest of rt. 609 junction. Soil series possibly Sassafras, thick surface phase. Slopes 2 to 7 percent, northeast facing. Marl deposits present.

7. Mixed hardwood forest 3/8 mi east of New Kent Airport along rt. 676. Slopes 2 to 7 percent, north and south facing.

8. White oak forest at rt. 632, rt. 611 junction near Black's Store. Multiple soil strata. Slopes 7 to 15 percent, north and south facing.

Hanover County

9. Oak forest east of rt. 619, ½ mi south of rt. 693 junction at Westwood. Possible soils are Craven, Kempsville, and Bourne fine sandy loam. Slopes 7 to 15 percent, east and west facing.

10. Mixed hardwood forest at Camp Hanover on east side of lake near the dam. Multiple soil strata. Slopes 7 to 30 percent. Northwest and southwest facing.

11. Oak forest across from rescue squad at Newmans, south of rt. 360 along rt. 615. Duplin and Marlboro fine sandy loams. 0 to 2 percent slopes.

12. Mixed hardwood forest in a steep ravine, located on fire road past the east end of rt. 750 near Crump Creek. Multiple soil strata. Slopes 15 to 45 percent, southeast and southwest facing.

13. Oak woods north of rt. 699, 3/4 mi east of rt. 651 junction near Crosses Corner. Faceville fine sandy loam and Orangeburg loamy sand. Slopes 5 to 20 percent, southeast and northwest facing.

14. Mixed hardwood forest below dam at Forest Lake Hills subdivision, located near C & O Railroad and rt. 643. Multiple soil strata. Slopes 10 to 25 percent, northeast and northwest facing.

15. Mixed hardwood forest southeast of rt. 622, ½ mi east of rt. 54 junction near Ashland. Faceville fine sandy loam and Sassafras-like loamy fine sand. Slopes 5 to 15 percent, north and south facing.

16. Oak forest south of Ashcake Road (rt. 657), ½ mi west of RF & P Railroad crossing near Ashland. Marlboro and Bourne fine sandy loams. Slopes 2 to 7 percent.

17. Oak forest on northwest side of Mill Road, ½ mi north of junction with Mountain Road (Henrico County). Bourne and Wedowee sandy loams. Slopes 4 to 10 percent, north facing.

18. Oak forest ½ mi northeast of rt. 657 near Stagg Creek. Wedowee fine sandy loam and Louisburg sandy loam. Slopes 2 to 15 percent, north facing.

19. Mixed hardwood forest east of rt. 671, ¼ mi north of rt. 657 junction near Cedar Creek. Possible soils are Wedowee, Colfax-Helena, Worsham, fine sandy loams and Tallapoosa soils. Slopes 2 to 10 percent, east facing.

20. Oak forest northeast of rt. 623 junction with rt. 271 at Hylas. Fluvanna loam. Slopes 2 to 7 percent, northeast facing.

21. Oak forest just west of Montpelier on south side of rt. 33, near rt. 751 junction. Cecil fine sandy loam. Slopes 2 to 15 percent, northwest facing.

Louisa County

22. Mixed oak forest west of rt. 664, ½ mi south of rt. 33 junction near Louisa--Hanover county line. Appling sandy loam. Slopes 2 to 7 percent, south and northwest facing.

23. Mixed hardwood forest at junction of rt. 601 and rt. 655 at Wickham Corner. Cecil-Pacolet clay loam and Cecil sandy loam. Slopes 2 to 15 percent, northwest facing.

24. Oak forest north of rt. 661, 2 mi north of rt. 610 junction near Inez. Appling sandy loam and Worsham fine sandy loam. Slopes 7 to 20 percent, east and west facing.

25. Mixed hardwood forest west of rt. 648, ¼ mi south of rt. 33 junction. Appling sandy loam. Slopes 2 to 15 percent, northeast and northwest facing.

26. Mixed hardwood forest along fire road west of rt. 755, 1 mi west or rt. 522 junction near Apple Grove. Pacolet-Cecil sandy loam. Slopes 7 to 25 percent, west facing.

27. Oak forest along rt. 758, 1/3 mi west of rt. 605 junction near Cuckoo. Tatum and Nason silt loams. Slopes 2 to 7 percent, south and southwest facing.

28. Mixed hardwood forest along gas pipeline, 3/4 mi southeast of rt. 605 near Yanceyville. Nason silt loam. Slopes 7 to 25 percent, east facing.

29. Mixed hardwood forest west of rt. 669, 1 mi north of rt. 33 junction at Louisa. Grover sandy loam. Slopes 2 to 15 percent, east facing.

30. Oak forest at end of rt. 721, 1 mi east of rt. 208, rt. 688 junction near Ferncliff. Colfax and Durham fine sandy loams. Slopes 2 to 7 percent, northeast facing.

APPENDIX B: SOILS DATA FOR THE THIRTY STANDS

SOIL ATTRIBUTE

Coastal Plain Stands:

Stand Number	Topographic Description	Organic Matter percent)	pH	Calcium CaO (ppm)	Magnesium MgO (ppm)	Phosphorus P_2O_5 (ppm)	Potassium K_2O (ppm)	Manganese (ppm)	Zinc (ppm)	A Horizon Depth (cm)	Sand (%)
1	high	2.9	4.6	352	44	11.0	56.0	15.5	2.1	46	41
	low	2.1	5.0	537	26	14.0	38.0	3.7	1.7		93
	$\bar{x}$:	2.5	4.8	444.5	35	12.5	42.0	9.6	1.9		67
2	high	1.8	4.2	67	8	12.0	38.0	1.3	1.1	48	71
	low	2.4	4.2	67	10	4.5	20.5	0.6	1.1		78
	$\bar{x}$:	2.1	4.2	67	9	8.5	24.25	9.95	1.1		74.5
3	high	1.5	4.7	101	18	2.0	38.5	6.8	0.9	33	57
	low	1.6	4.7	84	14	6.0	30.0	6.9	1.1		71
	$\bar{x}$:	1.55	4.7	92.5	12.5	2.5	34.25	6.85	1.0		64
4	level	1.5	4.8	67	10.0	2.0	24	11.9	1.1	36	69
5	high	1.9	4.6	50	8	1.0	33.5	3.4	0.8	28	58
	low	2.0	4.5	67	5	2.0	28.0	2.4	0.8		57
	$\bar{x}$:	1.95	4.55	58.5	6.5	1.5	30.75	2.9	0.8		57.5
6	high	2.1	5.3	252	34	2.0	36.5	16+	1.1	41	74
	low	2.6	5.6	470	61	11.0	54.0	16+	1.1		55
	$\bar{x}$:	2.35	5.45	361	47.5	6.5	42.75	16+	1.1		64.5
7	level	1.5	5.2	104	32	3.0	33.5	16+	1.2	20	68
8	high	1.5	4.5	67	8	2.0	20.5	1.9	0.6	28	62
	low	2.9	4.4	67	12	3.5	30.0	1.9	1.2		45
	$\bar{x}$:	2.2	4.45	67	10	2.75	25.25	1.9	0.9		53.5
9	high	1.7	4.6	67	10	2.0	20.5	3.8	0.8	61+	73
	low	2.2	4.6	67	12	5.5	28	6.6	1.1		68
	$\bar{x}$:	1.95	4.6	67	11	3.75	24.25	5.2	0.95		70.5
10	high	2.0	4.4	67	8	3.0	24	2.1	9.9	61+	90
	low	1.4	4.5	67	6	3.5	17	3.4	1.0		78
	$\bar{x}$:	1.7	4.45	67	7	3.25	20.5	2.75	9.95		84

Stand	Topographic Description	Organic Matter	pH	Calcium	Magnesium	Phosphorus	Potassium	Manganese	Zinc	A Horizon	Sand %
11	level	2.6	5.4	67	8	3.5	26.0	7.1	1.4	43	63
	high	2.1	4.6	84	26	14.0	46.5	3.5	1.3	30	88
12	low	1.6	4.7	67	36	7.5	61.5	5.3	1.0		86
	$\bar{x}$:	1.85	4.65	77.5	31	10.75	54.0	4.4			87
13	high	2.1	4.6	67	8	4.5	21.0	3.0	1.2	43	65
	low	2.3	4.5	67	8	12.0	33.5	8.2	1.3		68
	$\bar{x}$:	2.2	4.55	67	8	8.25	27.25	5.6			66.5
14	high	2.7	4.5	67	12	14.5	41.0	5.7	1.3	38	64
	low	1.5	4.8	67	10	3.0	28.0	4.4	0.5		74
	$\bar{x}$:	2.1	4.65	67	11	8.75	34.5	5.05			69
15	high	2.5	4.5	67	10	8.5	46.5	15.2	1.5	43	78
	low	3.3	4.5	84	16	5.5	45.0	14.0	1.4		51
	$\bar{x}$:	2.9	4.5	75.5	13	7.0	45.75	14.6			64.5
16	level	2.4	4.4	67	12	2.0	36.0	4.8	1.3	20	55
17	level	2.0	4.5	67	8	3.5	43.0	5.7	1.3	36	70
Piedmont Stands:											
18	high	1.8	4.6	67	14	3.0	46.5	14.0	1.8		68
	low	1.5	4.6	67	12	3.0	33.5	11.0	1.6	23	68
	$\bar{x}$:	1.65	4.6	67	13	3.0	40.0	12.5	1.7		68
	high	1.5	5.1	235	75	2.0	71.0	16+	2.1	18	55
19	low	1.8	5.0	185	71	2.0	52.5	16+	1.5		59
	$\bar{x}$:	1.65	5.05	210	73	2.0	61.75	16+			57

Stand Number	Topographic Description	Organic Matter	pH	Calcium	Magnesium	Phosphorus	Potassium	Manganese	Zinc	A Horizon	Sand %
20	level	2.1	4.4	50	12	2.0	41.0	11.5	1.0	30	42
21	level	2.1	4.8	67	14	1.0	35.5	10.5	1.2	10	64
22	level	2.4	4.8	84	12	3.0	33.5	14.7	1.0	36	65
23	high	2.6	4.8	51	14	3.0	43.0	16+	1.4	23	60
	low	3.4	4.8	84	50	5.5	58.0	16+	1.9		52
	$\bar{x}$:	3.0	4.8	67	32	4.25	50.5	16+			56
	high	2.1	4.9	84	26	6.5	52.5	16+	0.9	13	62
24	low	2.6	5.2	302	95	5.5	46.5	16+	1.4		66
	$\bar{x}$:	2.35	5.05	193	60.5	6.0	49.5	16+			64
25	level	2.3	4.8	67	14	4.5	37.5	16+	1.1	23	60
26	level	1.6	4.8	84	14	3.0	45.0	16+	1.5	13	61
27	level	2.5	4.7	67	10	1.0	35.5	7.5	1.3	20	45
	high	2.3	4.8	67	10	3.0	37.5	13.2	1.2	15	49
28	low	2.2	4.8	84	16	4.5	45.0	16+	1.2		46
	$\bar{x}$:	2.25	4.8	75.5	13	3.75	41.25	[14.6]	1.2		47.5
	high	1.5	4.9	101	22	3.5	45	16+	1.0	20	65
29	low	2.6	5.6	386	85	1.0	71.0	16+	1.2		64
	$\bar{x}$:	2.05	5.25	243.5	53.5	2.25	58.0	16+	1.1		64.5
30	level	2.1	4.5	50	6	4.5	41.0	8.3	1.3	43	69

[ ] biased toward low value due to analysis technique.

\+ maximum value possible due to the measurement or analysis technique.

APPENDIX C: ALPHABETIC CODES OF SPECIES USED IN THE ANALYSIS

ALPHABETIZED BY CODE

Shrubs:

Code	Scientific name
AARB	Amelanchier arborea
ASER	Alnus serrulata
CALN	Clethra alnifolia
CCAN	Cercis canadensis
CFLO	Cornus florida
CMAC	Chimaphila maculata
CPUM	Castanea pumila
CUMB	Chimaphila umbellata
CUNI	Crataegus uniflora
CVIR	Chionanthus virginicus
EAME	Euonymus americanus
EREP	Epigaea repens
GBAC	Gaylussacia baccata
GDUM	Gaylussacia dumosa
GFRO	Gaylussacia frondosa
GTRI	Gillenia trifoliata
HHYP	Hypericum hypericoides
HVIR	Hamamelis virginiana
IVER	Ilex verticillata
KLAT	Kalmia latifolia
LBEN	Lindera benzoin
LLIG	Lyonia ligustrina
LMAR	Lyonia mariana

Shrubs (cont.):

MCER	Myrica cerifera
MREP	Mitchella repens
MRUB	Morus rubra
MTRI	Unknown shrub B
RARG	Rubus spp.
RATL	Rhododendron alanticum
RNUD	Rhododendron nudiflorum
ROSA	Rosa spp.
SALB	Sassafras albidum
SARB	Sorbus arbutifolia
VACE	Viburnum acerifolium
VATR	Vaccinium atrococcum
VCOR	Vaccinium corymbosum
VDEN	Viburnum detatum
VPRU	Viburnum prunifolium
VSTA	Vaccinium stamineum
VTEL	Vaccinium sp.
VVAC	Vaccinium vacillans
USHA	Unknown shrub A
USHG	Unknown shrub G
USHH	Unknown shrub H
USHI	Unknown shrub I

Herbs:

APLA	Asplenium platyneuron
APUB	Agrimonia pubescens
ATRI	Arisaema triphyllum
AUVI	Aureolaria virginica
AVIR	Hexastylis virginica
BTIN	Baptisia tinctoria
CACA	Cypripedium acaule
CARX	Carex spp.
CVER	Coreopsis verticillata
CYVI	Cynoglossum virginianum
DNUD	Desmodium cf. nudiflorum
DPAN	Desmodium paniculatum
DROT	Desmodium rotundifolium
DVIL	Dioscorea villosa
ECOR	Euphorbia corrolata
FERF	Unknown fern sp. F
FVIR	Fragaria virginiana
GALX	Galium spp.
GCAN	Geum canadense
GCIR	Galium circaezans
GPIL	Galium pilosum
GPUB	Goodyera pubescens
GRAX	Poaceae spp.
GTIN	Galium tinctorum
HCAE	Houstonia caerulea
HPUR	Houstonia purpurea
HVEN	Hieracium venosum
ISOV	Isotria verticillata
IV-M	Isotria-Medeola
LFLA	Lycopodium flabelliforme

LLAN	Lysimachia lanceolata
LQUA	Lysimachia quadrifolia
MVIR	Medeola virginica
OCIN	Osmunda cinnamomea
OSEN	Onoclea sensibilis
OSTR	Oxalis stricta
PACR	Polystichum acrostichoides
PALB	Prenanthes alba
PANX	Panicum spp. narrow leaf
PAQU	Pteridium aquilinum
PAWX	Panicum spp. wide leaf
PBIF	Polygonatum biflorum
POTA	Potentilla canandensis-simplex
PPEL	Podophyllum peltatum
PREC	Potentilla recta
RREC	Ranunculus recurvatus
SCAE	Solidago cf. caesia
SELI	Scutellaria epiptica
SRAC	Smilacina racemosa
TPAL	Thelypteris palustris-noveboracensis
UPER	Uvularia perfoliata
UHAA	Unknown herb AA
UHAC	Unknown herb AC
UHAE	Unknown herb AE
UHAD	Unknown herb AD
UHAG	Unknown herb AG
UHAK	Unknown herb AK
UHAN	Unknown herb AN

UHAO	Unknown herb AO
UHAP	Unknown herb AP
UHAQ	Unknown herb AQ
UHAS	Unknown herb AS
UHAT	Unknown herb AT
UHAV	Unknown herb AV
UHAY	Unknown herb AY
UHBA	Unknown herb BA
UHBB	Unknown herb BB
UHBC	Unknown herb BC
UHBD	Unknown herb BD
UHBI	Unknown herb BI
UHBK	Unknown herb BK
UHBM	Unknown herb BM
UHBN	Unknown herb BN
UHBO	Unknown herb BO
UHBP	Unknown herb BP
UHBQ	Unknown herb BQ
UHBR	Unknown herb BR
UHBS	unknown herb BS
UHBT	Unknown herb BT
VPAP	Viola cf. papillionacea

Appendix D: Raw Vegetation Data.

This table includes summary data for each stand. Included are the frequency, absolute density/120 m^2, and average density (density/frequency) and of each species found in a stand. The summary table at the end is the form used in the cluster analysis. Also included are the density totals for each species in the analysis, density totals for each stand, and richness and diversity values for each stand.

STAND	CODE	SPECIES	FREQ.	DENSITY	AVG. DENSITY
1	4CCAN	CERCIS CANADENSIS	1	4.000	4.000
1	5CMAC	CHIMAPHILA MACULATA	4	19.000	4.750
1	9CFLO	CORNUS FLORIDA	10	76.000	7.600
1	12EAME	EUONYMOUS AMERICANUS	13	239.000	18.385
1	21LBEN	LINDERA BENZOIN	4	8.000	2.000
1	24MREP	MITCHELLA REPENS	9	327.000	36.333
1	28RNUD	RHODODENDRON NUDIFLORUM	4	40.000	10.000
1	30RARG	RUBUS SPP	1	1.000	1.000
1	34VCOR	VACCIUIUM CORYMBOSUM	2	3.000	1.500
1	36VVAC	VACCINIUM VACILLANS	4	27.000	6.750
1	41USHA	UNKNOWN SHRUB A	1	1.000	1.000
1	48APLA	ASPLENIUM PLATYNEURON	1	2.000	2.000
1	51CARX	CAREX SPP	3	10.000	3.333
1	55DNUD	DESMODIUM CF NUDIFLORUM	6	13.000	2.167
1	56DPAN	DESMODIUM PANICULATUM	1	1.000	1.000
1	58DVIL	DIOSCOREA VILLOSA	9	38.000	4.222
1	61GCIR	GALIUM CIRCAEZANS	9	66.000	7.333
1	65GCAN	GEUM CANADENSE	1	1.000	1.000
1	66GPUB	GOODYERA PUBESCENS	2	4.000	2.000
1	67AVIR	HEXASTYLIS VIRGINICA	7	109.000	15.571
1	77OSEN	ONOCLEA SENSIBILIS	1	5.000	5.000
1	79OSTR	OXALIS STRICTA	2	39.000	19.500
1	81PAWX	PANICUM SPP WIDE LEAF	7	205.000	29.286
1	82GRAX	POACEAE SPP	10	223.000	22.300
1	83PPEL	PODOPHYLLUM PELTATUM	3	9.000	3.000
1	84PBIF	POLYGONATUM BIFLORUM	9	155.000	17.222
1	85PACR	POLYSTICHUM ACROSTICHOIDES	7	116.000	16.571
1	87POTA	POTENTILLA CANADENSIS-SIMPLE	1	1.000	1.000
1	88PALB	PRENANTHES ALBA	2	3.000	1.500
1	90RREC	RANUNCULUS RECURVATUS	1	2.000	2.000
1	92SRAC	SMILACINA RACEMOSA	8	54.000	6.750
1	93SCAE	SOLIDAGO CF CAESIA	3	7.000	2.333
1	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	3	51.000	17.000
1	96VPAP	VIOLA CF PAPILLIONACEA	5	11.000	2.200
1	97UHAA	DICOT HERB SP AA	1	1.000	1.000
1	98UHAC	DICOT HERB SP AC	1	2.000	2.000
1	99UHAE	DICOT HERB SP AE	1	3.000	3.000
1	100UHAD	DICOT HERB SP AD	1	4.000	4.000
1	102UHAK	DICOT HERB SP AK	1	2.000	2.000
2	3CPUM	CASTANEA PUMILA	1	3.000	3.000
2	5CMAC	CHIMAPHILA MACULATA	2	4.000	2.000
2	9CFLO	CORNUS FLORIDA	2	2.000	1.000
2	12EAME	EUONYMOUS AMERICANUS	11	89.000	8.091
2	13GBAC	GAYLUSSACIA BACCATA	4	33.000	8.250
2	17HVIR	HAMAMELIS VIRGINIANA	1	3.000	3.000
2	21LBEN	LINDERA BENZOIN	1	2.000	2.000
2	22LLIG	LYONIA LIGUSTRINA	5	17.000	3.400
2	24MREP	MITCHELLA REPENS	12	313.000	26.083
2	28RNUD	RHODODENDRON NUDIFLORUM	4	18.000	4.500
2	35VSTA	VACCINIUM STAMINEUM	1	1.000	1.000
2	36VVAC	VACCINIUM VACILLANS	12	223.000	18.583
2	42MTRI	UNKNOWN SHRUB SP B	3	7.000	2.333
2	55DNUD	DESMODIUM CF NUDIFLORUM	4	7.000	1.750
2	66GPUB	GOODYERA PUBESCENS	1	4.000	4.000
2	67AVIR	HEXASTYLIS VIRGINICA	5	29.000	5.800
2	84PBIF	POLYGONATUM BIFLORUM	4	8.000	2.000
3	2AARB	AMELANCHIER ARBOREA	5	13.000	2.600
3	5CMAC	CHIMAPHILA MACULATA	1	1.000	1.000
3	8CALN	CLETHRA ALNIFOLIA	1	5.000	5.000
3	9CFLO	CORNUS FLORIDA	7	37.000	5.286
3	12EAME	EUONYMOUS AMERICANUS	13	267.000	20.538
3	13GBAC	GAYLUSSACIA BACCATA	3	14.000	4.667
3	15GFRO	GAYLUSSACIA FRONDOSA	1	51.000	51.000
3	20KLAT	KALMIA LATIFOLIA	1	1.000	1.000
3	24MREP	MITCHELLA REPENS	14	722.000	51.571
3	26MCER	MYRICA CERIFERA	2	3.000	1.500
3	28RNUD	RHODODENDRON NUDIFLORUM	1	2.000	2.000
3	35VSTA	VACCINIUM STAMINEUM	3	4.000	1.333
3	36VVAC	VACCINIUM VACILLANS	4	29.000	7.250
3	51CARX	CAREX SPP	1	2.000	2.000
3	55DNUD	DESMODIUM CF NUDIFLORUM	5	27.000	5.400
3	61GCIR	GALIUM CIRCAEZANS	1	2.000	2.000
3	73LFLA	LYCOPODIUM FLABELLIFORME	9	9.000	1.000
3	76MVIR	MEDEOLA VIRGINICA	1	7.000	7.000
3	79OSTR	OXALIS STRICTA	1	6.000	6.000
3	81PAWX	PANICUM SPP WIDE LEAF	1	4.000	4.000
3	82GRAX	POACEAE SPP	4	18.000	4.500
3	84PBIF	POLYGONATUM BIFLORUM	1	4.000	4.000
3	85PACR	POLYSTICHUM ACROSTICHOIDES	6	53.000	8.833
3	87POTA	POTENTILLA CANADENSIS-SIMPLE	1	3.000	3.000
3	92SRAC	SMILACINA RACEMOSA	1	2.000	2.000
3	93SCAE	SOLIDAGO CF CAESIA	1	4.000	4.000
3	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	4	20.000	5.000
3	96VPAP	VIOLA CF PAPILLIONACEA	1	2.000	2.000
4	5CMAC	CHIMAPHILA MACULATA	6	12.000	2.000
4	9CFLO	CORNUS FLORIDA	9	66.000	7.333
4	10CUNI	CRATAEGUS UNIFLORA	3	4.000	1.333
4	13GBAC	GAYLUSSACIA BACCATA	11	178.000	16.182
4	15GFRO	GAYLUSSACIA FRONDOSA	1	2.000	2.000
4	20KLAT	KALMIA LATIFOLIA	2	4.000	2.000
4	24MREP	MITCHELLA REPENS	14	1473.000	105.214
4	25MRUB	MORUS RUBRA	1	1.000	1.000
4	29ROSA	ROSA SPP	1	1.000	1.000
4	31SALB	SASSAFRAS ALBIDUM	8	13.000	1.625
4	33VATR	VACCINIUM ATROCOCCUM	2	13.000	6.500
4	35VSTA	VACCINIUM STAMINEUM	12	133.000	11.083
4	36VVAC	VACCINIUM VACILLANS	3	121.000	40.333
4	38VACE	VIBURNUM ACERIFOLIUM	1	5.000	5.000
4	39VDEN	VIBURNUM DENTATUM	2	13.000	6.500
4	55DNUD	DESMODIUM CF NUDIFLORUM	1	6.000	6.000
4	56DPAN	DESMODIUM PANICULATUM	1	1.000	1.000
4	57DROT	DESMODIUM ROTUNDIFOLIA	2	4.000	2.000
4	81PAWX	PANICUM SPP WIDE LEAF	2	3.000	1.500
4	82GRAX	POACEAE SPP	2	4.000	2.000
4	84PBIF	POLYGONATUM BIFLORUM	2	18.000	9.000
4	85PACR	POLYSTICHUM ACROSTICHOIDES	1	1.000	1.000
4	88PALB	PRENANTHES ALBA	1	2.000	2.000
4	92SRAC	SMILACINA RACEMOSA	1	6.000	6.000
4	93SCAE	SOLIDAGO CF CAESIA	2	2.000	1.000
5	5CMAC	CHIMAPHILA MACULATA	7	89.000	12.714
5	6CUMB	CHIMAPHILA UMBELLATA	1	3.000	3.000
5	9CFLO	CORNUS FLORIDA	2	5.000	2.500
5	13GBAC	GAYLUSSACIA BACCATA	7	170.000	24.286
5	14GDUM	GAYLUSSACIA DUMOSA	1	5.000	5.000
5	15GFRO	GAYLUSSACIA FRONDOSA	2	5.000	2.500
5	18HHYP	HYPERICUM HYPERICOIDES	1	2.000	2.000
5	22LLIG	LYONIA LIGUSTRINA	2	38.000	19.000
5	24MREP	MITCHELLA REPENS	6	65.000	10.833
5	27RATL	RHODODENDRON ATLANTICUM	4	144.000	36.000
5	30RARG	RUBUS SPP	4	7.000	1.750
5	31SALB	SASSAFRAS ALBIDUM	6	52.000	8.667
5	32SARB	SORBUS ARBUTIFOLIA	1	2.000	2.000
5	35VSTA	VACCINIUM STAMINEUM	7	102.000	14.571
5	36VVAC	VACCINIUM VACILLANS	12	572.000	47.667
5	52CVER	COREOPSIS VERTICILLATA	1	5.000	5.000
5	54CACA	CYPRIPEDIUM ACAULE	2	3.000	1.500
5	80PANX	PANICUM SPP NARROW LEAF	1	2.000	2.000

5	82GRAX	POACEAE SPP	4	151.000	37.750
5	84PBIF	POLYGONATUM BIFLORUM	3	9.000	3.000
5	89PAQU	PTERIDIUM AQUILINUM	2	36.000	18.000
5	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	1	11.000	11.000
5	112UHBB	DICOT HERB SP BB	1	2.000	2.000
5	113UHBC	DICOT HERB SP BC	1	1.000	1.000
6	3CPUM	CASTANEA PUMILA	1	2.000	2.000
6	4CCAN	CERCIS CANADENSIS	4	6.000	1.500
6	5CMAC	CHIMAPHILA MACULATA	7	15.000	2.143
6	9CFLO	CORNUS FLORIDA	14	144.000	10.286
6	12EAME	EUONYMOUS AMERICANUS	10	377.000	37.700
6	24MREP	MITCHELLA REPENS	3	45.000	15.000
6	25MRUB	MORUS RUBRA	5	8.000	1.600
6	31SALB	SASSAFRAS ALBIDUM	4	8.000	2.000
6	32SARB	SORBUS ARBUTIFOLIA	4	9.000	2.250
6	33VATR	VACCINIUM ATROCOCCUM	1	3.000	3.000
6	35VSTA	VACCINIUM STAMINEUM	2	28.000	14.000
6	36VVAC	VACCINIUM VACILLANS	2	19.000	9.500
6	42MTRI	UNKNOWN SHRUB SP B	1	2.000	2.000
6	53CVVI	CYNOGLOSSUM VIRGINIANUM	1	1.000	1.000
6	55DNUD	DESMODIUM CF NUDIFLORUM	10	50.000	5.000
6	61GCIR	GALIUM CIRCAEZANS	11	263.000	23.909
6	65GCAN	GEUM CANADENSE	8	20.000	2.500
6	66GPUB	GOODYERA PUBESCENS	1	2.000	2.000
6	80PANX	PANICUM SPP NARROW LEAF	1	3.000	3.000
6	81PAWX	PANICUM SPP WIDE LEAF	4	15.000	3.750
6	82GRAX	POACEAE SPP	2	16.000	8.000
6	83PPEL	PODOPHYLLUM PELTATUM	5	19.000	3.800
6	87POTA	POTENTILLA CANADENSIS-SIMPLE	1	2.000	2.000
6	88PALB	PRENANTHES ALBA	1	1.000	1.000
6	95UPER	UVULARIA PERFOLIATA	4	23.000	5.750
6	96VPAP	VIOLA CF PAPILLIONACEA	1	9.000	9.000
6	107UHAS	DICOT HERB SP AS	1	2.000	2.000
6	108UHAT	DICOT HERB SP AT	1	1.000	1.000
6	109UHAV	DICOT HERB SP AV	1	2.000	2.000
7	3CPUM	CASTANEA PUMILA	3	12.000	4.000
7	5CMAC	CHIMAPHILA MACULATA	1	2.000	2.000
7	9CFLO	CORNUS FLORIDA	8	35.000	4.375
7	12EAME	EUONYMOUS AMERICANUS	14	536.000	38.286
7	21LBEN	LINDERA BENZOIN	1	1.000	1.000
7	24MREP	MITCHELLA REPENS	9	143.000	15.889
7	31SALB	SASSAFRAS ALBIDUM	6	15.000	2.500
7	33VATR	VACCINIUM ATROCOCCUM	1	3.000	3.000
7	35VSTA	VACCINIUM STAMINEUM	4	22.000	5.500
7	36VVAC	VACCINIUM VACILLANS	4	24.000	6.000
7	55DNUD	DESMODIUM CF NUDIFLORUM	1	1.000	1.000
7	63GTIN	GALIUM TINCTORUM	1	3.000	3.000
7	64GALX	GALIUM SPP	1	3.000	3.000
7	83PPEL	PODOPHYLLUM PELTATUM	1	1.000	1.000
7	84PBIF	POLYGONATUM BIFLORUM	1	3.000	3.000
7	85PACR	POLYSTICHUM ACROSTICHOIDES	1	2.000	2.000
7	92SRAC	SMILACINA RACEMOSA	2	3.000	1.500
8	2AARB	AMELANCHIER ARBOREA	1	1.000	1.000
8	5CMAC	CHIMAPHILA MACULATA	2	4.000	2.000
8	13GBAC	GAYLUSSACIA BACCATA	8	266.000	33.250
8	18HHYP	HYPERICUM HYPERICOIDES	1	11.000	11.000
8	24MREP	MITCHELLA REPENS	4	91.000	22.750
8	28RNUD	RHODODENDRON NUDIFLORUM	6	209.000	34.833
8	31SALB	SASSAFRAS ALBIDUM	5	7.000	1.400
8	35VSTA	VACCINIUM STAMINEUM	1	7.000	7.000
8	36VVAC	VACCINIUM VACILLANS	10	311.000	31.100
8	54CACA	CYPRIPEDIUM ACAULE	1	1.000	1.000
8	67AVIR	HEXASTYLIS VIRGINICA	3	12.000	4.000
8	71IV-M	ISOTRIA--MEDEOLA	2	6.000	3.000
8	80PANX	PANICUM SPP NARROW LEAF	1	6.000	6.000
8	82GRAX	POACEAE SPP	2	4.000	2.000
9	3CPUM	CASTANEA PUMILA	2	4.000	2.000
9	5CMAC	CHIMAPHILA MACULATA	2	2.000	1.000
9	7CVIR	CHIONANTHUS VIRGINICUS	1	1.000	1.000
9	9CFLO	CORNUS FLORIDA	13	77.000	5.923
9	12EAME	EUONYMOUS AMERICANUS	1	18.000	18.000
9	13GBAC	GAYLUSSACIA BACCATA	3	14.000	4.667
9	15GFRO	GAYLUSSACIA FRONDOSA	1	5.000	5.000
9	31SALB	SASSAFRAS ALBIDUM	4	5.000	1.250
9	35VSTA	VACCINIUM STAMINEUM	9	45.000	5.000
9	36VVAC	VACCINIUM VACILLANS	12	315.000	26.250
9	38VACE	VIBURNUM ACERIFOLIUM	4	9.000	2.250
9	39VDEN	VIBURNUM DENTATUM	1	2.000	2.000
9	40VPRU	VIBURNUM PRUNIFOLIUM	1	2.000	2.000
9	51CARX	CAREX SPP	2	3.000	1.500
9	55DNUD	DESMODIUM CF NUDIFLORUM	3	5.000	1.667
9	81PAWX	PANICUM SPP WIDE LEAF	1	1.000	1.000
9	82GRAX	POACEAE SPP	1	5.000	5.000
9	84PBIF	POLYGONATUM BIFLORUM	3	8.000	2.667
10	3CPUM	CASTANEA PUMILA	1	1.000	1.000
10	5CMAC	CHIMAPHILA MACULATA	4	13.000	3.250
10	7CVIR	CHIONANTHUS VIRGINICUS	1	7.000	7.000
10	9CFLO	CORNUS FLORIDA	5	18.000	3.600
10	12EAME	EUONYMOUS AMERICANUS	2	44.000	22.000
10	13GBAC	GAYLUSSACIA BACCATA	3	44.000	14.667
10	31SALB	SASSAFRAS ALBIDUM	9	18.000	2.000
10	35VSTA	VACCINIUM STAMINEUM	6	50.000	8.333
10	36VVAC	VACCINIUM VACILLANS	13	271.000	20.846
10	54CACA	CYPRIPEDIUM ACAULE	1	3.000	3.000
10	55DNUD	DESMODIUM CF NUDIFLORUM	2	4.000	2.000
10	56DPAN	DESMODIUM PANICULATUM	1	4.000	4.000
10	82GRAX	POACEAE SPP	1	1.000	1.000
10	84PBIF	POLYGONATUM BIFLORUM	2	3.000	1.500
10	92SRAC	SMILACINA RACEMOSA	1	2.000	2.000
11	5CMAC	CHIMAPHILA MACULATA	4	11.000	2.750
11	9CFLO	CORNUS FLORIDA	3	9.000	3.000
11	12EAME	EUONYMOUS AMERICANUS	1	1.000	1.000
11	13GBAC	GAYLUSSACIA BACCATA	4	133.000	33.250
11	15GFRO	GAYLUSSACIA FRONDOSA	4	168.000	42.000
11	18HHYP	HYPERICUM HYPERICOIDES	2	16.000	8.000
11	28RNUD	RHODODENDRON NUDIFLORUM	1	112.000	112.000
11	31SALB	SASSAFRAS ALBIDUM	3	3.000	1.000
11	35VSTA	VACCINIUM STAMINEUM	9	72.000	8.000
11	36VVAC	VACCINIUM VACILLANS	11	120.000	10.909
11	80PANX	PANICUM SPP NARROW LEAF	1	3.000	3.000
12	2AARB	AMELANCHIER ARBOREA	2	3.000	1.500
12	5CMAC	CHIMAPHILA MACULATA	6	9.000	1.500
12	7CVIR	CHIONANTHUS VIRGINICUS	2	8.000	4.000
12	9CFLO	CORNUS FLORIDA	4	13.000	3.250
12	12EAME	EUONYMOUS AMERICANUS	4	39.000	9.750
12	13GBAC	GAYLUSSACIA BACCATA	1	21.000	21.000
12	22LLIG	LYONIA LIGUSTRINA	1	1.000	1.000
12	28RNUD	RHODODENDRON NUDIFLORUM	10	102.000	10.200
12	31SALB	SASSAFRAS ALBIDUM	6	7.000	1.167
12	33VATR	VACCINIUM ATROCOCCUM	3	7.000	2.333
12	35VSTA	VACCINIUM STAMINEUM	4	21.000	5.250
12	36VVAC	VACCINIUM VACILLANS	9	214.000	23.778
12	40VPRU	VIBURNUM PRUNIFOLIUM	1	2.000	2.000
12	51CARX	CAREX SPP	2	9.000	4.500
12	55DNUD	DESMODIUM CF NUDIFLORUM	6	34.000	5.667
12	56DPAN	DESMODIUM PANICULATUM	1	2.000	2.000
12	58DVIL	DIOSCOREA VILLOSA	1	2.000	2.000
12	67AVIR	HEXASTYLIS VIRGINICA	1	5.000	5.000

12	69HVEN	HIERACIUM VENOSUM	1	1.000	1.000
12	78OCIN	OSMUNDA CINNAMOMEA	1	2.000	2.000
12	84PBIF	POLYGONATUM BIFLORUM	2	3.000	1.500
12	85PACR	POLYSTICHUM ACROSTICHOIDES	4	27.000	6.750
12	92SRAC	SMILACINA RACEMOSA	1	8.000	8.000
12	93SCAE	SOLIDAGO CF CAESIA	3	5.000	1.667
12	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	2	10.000	5.000
12	96VPAP	VIOLA CF PAPILLIONACEA	2	4.000	2.000
13	5CMAC	CHIMAPHILA MACULATA	2	4.000	2.000
13	7CVIR	CHIONANTHUS VIRGINICUS	1	1.000	1.000
13	11EREP	EPIGAEA REPENS	1	23.000	23.000
13	12EAME	EUONYMOUS AMERICANUS	2	14.000	7.000
13	13GBAC	GAYLUSSACIA BACCATA	10	614.000	61.400
13	23LMAR	LYONIA MARIANA	2	18.000	9.000
13	28RNUD	RHODODENDRON NUDIFLORUM	7	90.000	12.857
13	31SALB	SASSAFRAS ALBIDUM	6	18.000	3.000
13	35VSTA	VACCINIUM STAMINEUM	6	23.000	3.833
13	36VVAC	VACCINIUM VACILLANS	15	542.000	36.133
13	51CARX	CAREX SPP	2	32.000	16.000
13	72ISOV	ISOTRIA VERTICILLATA	1	1.000	1.000
13	80PANX	PANICUM SPP NARROW LEAF	2	23.000	11.500
13	82GRAX	POACEAE SPP	1	16.000	16.000
13	84PBIF	POLYGONATUM BIFLORUM	2	6.000	3.000
13	91SELI	SCUTELLARIA ELIPTICA	1	1.000	1.000
14	2AARB	AMELANCHIER ARBOREA	1	1.000	1.000
14	5CMAC	CHIMAPHILA MACULATA	2	13.000	6.500
14	9CFLO	CORNUS FLORIDA	5	8.000	1.600
14	13GBAC	GAYLUSSACIA BACCATA	8	211.000	26.375
14	22LLIG	LYONIA LIGUSTRINA	1	1.000	1.000
14	28RNUD	RHODODENDRON NUDIFLORUM	3	111.000	37.000
14	31SALB	SASSAFRAS ALBIDUM	8	14.000	1.750
14	33VATR	VACCINIUM ATROCOCCUM	1	1.000	1.000
14	35VSTA	VACCINIUM STAMINEUM	8	104.000	13.000
14	36VVAC	VACCINIUM VACILLANS	9	139.000	15.444
14	55DNUD	DESMODIUM CF NUDIFLORUM	1	1.000	1.000
14	56DPAN	DESMODIUM PANICULATUM	1	1.000	1.000
14	80PANX	PANICUM SPP NARROW LEAF	1	3.000	3.000
14	84PBIF	POLYGONATUM BIFLORUM	1	2.000	2.000
14	92SRAC	SMILACINA RACEMOSA	1	1.000	1.000
14	95UPER	UVULARIA PERFOLIATA	1	22.000	22.000
15	2AARB	AMELANCHIER ARBOREA	1	2.000	2.000
15	3CPUM	CASTANEA PUMILA	4	29.000	7.250
15	5CMAC	CHIMAPHILA MACULATA	2	11.000	5.500
15	7CVIR	CHIONANTHUS VIRGINICUS	2	4.000	2.000
15	9CFLO	CORNUS FLORIDA	10	42.000	4.200
15	12EAME	EUONYMOUS AMERICANUS	10	364.000	36.400
15	13GBAC	GAYLUSSACIA BACCATA	4	16.000	4.000
15	15GFRO	GAYLUSSACIA FRONDOSA	2	9.000	4.500
15	19IVER	ILEX VERTICILLATA	1	1.000	1.000
15	22LLIG	LYONIA LIGUSTRINA	3	29.000	9.667
15	28RNUD	RHODODENDRON NUDIFLORUM	6	64.000	10.667
15	31SALB	SASSAFRAS ALBIDUM	3	5.000	1.667
15	32SARB	SORBUS ARBUTIFOLIA	1	2.000	2.000
15	33VATR	VACCINIUM ATROCOCCUM	1	2.000	2.000
15	35VSTA	VACCINIUM STAMINEUM	4	31.000	7.750
15	36VVAC	VACCINIUM VACILLANS	12	368.000	30.667
15	55DNUD	DESMODIUM CF NUDIFLORUM	8	35.000	4.375
15	76MVIR	MEDEOLA VIRGINICA	1	1.000	1.000
15	84PBIF	POLYGONATUM BIFLORUM	1	1.000	1.000
15	92SRAC	SMILACINA RACEMOSA	4	13.000	3.250
15	93SCAE	SOLIDAGO CF CAESIA	1	1.000	1.000
15	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	1	5.000	5.000
15	117UHBM	DICOT HERB SP BM	1	1.000	1.000
16	2AARB	AMELANCHIER ARBOREA	4	38.000	9.500
16	8CALN	CLETHRA ALNIFOLIA	3	53.000	17.667
16	13GBAC	GAYLUSSACIA BACCATA	12	269.000	22.333
16	15GFRO	GAYLUSSACIA FRONDOSA	14	386.000	27.571
16	18HHYP	HYPERICUM HYPERICOIDES	2	3.000	1.500
16	23LMAR	LYONIA MARIANA	1	9.000	9.000
16	27RATL	RHODODENDRON ATLANTICUM	1	10.000	10.000
16	28RNUD	RHODODENDRON NUDIFLORUM	2	51.000	25.500
16	31SALB	SASSAFRAS ALBIDUM	5	10.000	2.000
16	32SARB	SORBUS ARBUTIFOLIA	1	3.000	3.000
16	35VSTA	VACCINIUM STAMINEUM	9	78.000	8.667
16	36VVAC	VACCINIUM VACILLANS	13	680.000	52.308
16	71IV-M	ISOTRIA--MEDEOLA	1	1.000	1.000
16	76MVIR	MEDEOLA VIRGINICA	1	2.000	2.000
16	82GRAX	POACEAE SPP	1	2.000	2.000
17	2AARB	AMELANCHIER ARBOREA	3	12.000	4.000
17	7CVIR	CHIONANTHUS VIRGINICUS	1	4.000	4.000
17	9CFLO	CORNUS FLORIDA	2	3.000	1.500
17	13GBAC	GAYLUSSACIA BACCATA	13	342.000	26.308
17	15GFRO	GAYLUSSACIA FRONDOSA	7	132.000	18.857
17	28RNUD	RHODODENDRON NUDIFLORUM	3	10.000	3.333
17	31SALB	SASSAFRAS ALBIDUM	10	31.000	3.100
17	35VSTA	VACCINIUM STAMINEUM	5	26.000	5.200
17	36VVAC	VACCINIUM VACILLANS	15	370.000	24.667
17	84PBIF	POLYGONATUM BIFLORUM	2	3.000	1.500
18	2AARB	AMELANCHIER ARBOREA	4	34.000	8.500
18	5CMAC	CHIMAPHILA MACULATA	4	5.000	1.250
18	8CALN	CLETHRA ALNIFOLIA	4	107.000	26.750
18	9CFLO	CORNUS FLORIDA	3	3.000	1.000
18	12EAME	EUONYMOUS AMERICANUS	1	1.000	1.000
18	13GBAC	GAYLUSSACIA BACCATA	1	12.000	12.000
18	15GFRO	GAYLUSSACIA FRONDOSA	10	370.000	37.000
18	19IVER	ILEX VERTICILLATA	1	3.000	3.000
18	28RNUD	RHODODENDRON NUDIFLORUM	1	5.000	5.000
18	31SALB	SASSAFRAS ALBIDUM	12	83.000	6.917
18	33VATR	VACCINIUM ATROCOCCUM	2	5.000	2.500
18	34VCOR	VACCIUIUM CORYMBOSUM	4	5.000	1.250
18	35VSTA	VACCINIUM STAMINEUM	10	119.000	11.900
18	36VVAC	VACCINIUM VACILLANS	14	408.000	29.143
18	39VDEN	VIBURNUM DENTATUM	2	6.000	3.000
18	54CACA	CYPRIPEDIUM ACAULE	1	1.000	1.000
18	69HCAE	HOUSTONIA CAERULEA	1	3.000	3.000
18	71IV-M	ISOTRIA--MEDEOLA	1	1.000	1.000
18	75LQUA	LYSIMACHIA QUADRIFOLIA	1	2.000	2.000
18	81PAWX	PANICUM SPP WIDE LEAF	1	2.000	2.000
18	82GRAX	POACEAE SPP	2	19.000	9.500
18	87POTA	POTENTILLA CANADENSIS-SIMPLE	1	1.000	1.000
18	92SRAC	SMILACINA RACEMOSA	1	1.000	1.000
18	106UHAQ	DICOT HERB SP AQ	1	3.000	3.000
19	3CPUM	CASTANEA PUMILA	1	1.000	1.000
19	4CCAN	CERCIS CANADENSIS	4	7.000	1.750
19	5CMAC	CHIMAPHILA MACULATA	8	22.000	2.750
19	9CFLO	CORNUS FLORIDA	5	46.000	9.200
19	10CUNI	CRATAEGUS UNIFLORA	1	1.000	1.000
19	12EAME	EUONYMOUS AMERICANUS	13	569.000	43.769
19	13GBAC	GAYLUSSACIA BACCATA	1	6.000	6.000
19	18HHYP	HYPERICUM HYPERICOIDES	1	7.000	7.000
19	19IVER	ILEX VERTICILLATA	3	5.000	1.667
19	22LLIG	LYONIA LIGUSTRINA	2	14.000	7.000
19	24MREP	MITCHELLA REPENS	7	662.000	94.571
19	25MRUB	MORUS RUBRA	1	1.000	1.000
19	30RARG	RUBUS SPP	6	25.000	4.167
19	35VSTA	VACCINIUM STAMINEUM	4	7.000	1.750
19	36VVAC	VACCINIUM VACILLANS	8	75.000	9.375
19	37VTLL	VACCINIUM UNK SPP	3	9.000	3.000

19	38VACE	VIBURNUM ACERIFOLIUM	2	6.000	3.000
19	46APUB	AGRUMONIA PUBESCENS	1	1.000	1.000
19	47ATRI	ARISAEMA TRIPHYLLUM	7	54.000	7.714
19	49AUVI	AUREOLARIA VIRGINICA	5	15.000	3.000
19	51CARX	CAREX SPP	7	112.000	16.000
19	55DNUD	DESMODIUM CF NUDIFLORUM	9	67.000	7.444
19	58DVIL	DIOSCOREA VILLOSA	2	10.000	5.000
19	60FVIR	FRAGARIA VIRGINIANA	1	1.000	1.000
19	61GCIR	GALIUM CIRCAEZANS	3	10.000	3.333
19	65GCAN	GEUM CANADENSE	2	2.000	1.000
19	66GPUB	GOODYERA PUBESCENS	2	13.000	6.500
19	72ISOV	ISOTRIA VERTICILLATA	1	1.000	1.000
19	81PAWX	PANICUM SPP WIDE LEAF	2	8.000	4.000
19	82GRAX	POACEAE SPP	6	122.000	20.333
19	84PBIF	POLYGONATUM BIFLORUM	12	90.000	7.500
19	85PACR	POLYSTICHUM ACROSTICHOIDES	4	15.000	3.750
19	87POTA	POTENTILLA CANADENSIS-SIMPLE	6	31.000	5.167
19	88PALB	PRENANTHES ALBA	4	6.000	1.500
19	92SRAC	SMILACINA RACEMOSA	14	160.000	11.429
19	93SCAE	SOLIDAGO CF CALSIA	2	3.000	1.500
19	95UPER	UVULARIA PERFOLIATA	7	101.000	14.429
19	96VPAP	VIOLA CF PAPILLIONACEA	4	12.000	3.000
19	118UHBN	DICOT HERB SP BN	1	1.000	1.000
19	119UHBO	DICOT HERB SP BO	2	8.000	4.000
19	120UHBP	DICOT HERB SP BP	1	4.000	4.000
19	121UHBQ	DICOT HERB SP BQ	1	1.000	1.000
19	123UHBS	DICOT HERB SP BS	1	1.000	1.000
20	2AARB	AMELANCHIER ARBOREA	4	12.000	3.000
20	12EAME	EUONYMOUS AMERICANUS	1	11.000	11.000
20	13GBAC	GAYLUSSACIA BACCATA	5	103.000	20.600
20	15GFRO	GAYLUSSACIA FRONDOSA	12	509.000	42.417
20	24MREP	MITCHELLA REPENS	3	171.000	57.000
20	31SALB	SASSAFRAS ALBIDUM	1	3.000	3.000
20	32SARB	SORBUS ARBUTIFOLIA	5	31.000	6.200
20	34VCOR	VACCIUIUM CORYMBOSUM	8	46.000	5.750
20	35VSTA	VACCINIUM STAMINEUM	7	57.000	8.143
20	36VVAC	VACCINIUM VACILLANS	6	84.000	14.000
20	39VDEN	VIBURNUM DENTATUM	3	33.000	11.000
20	54CACA	CYPRIPEDIUM ACAULE	4	8.000	2.000
20	82GRAX	POACEAE SPP	6	57.000	9.500
21	2AARB	AMELANCHIER ARBOREA	1	3.000	3.000
21	5CMAC	CHIMAPHILA MACULATA	12	59.000	4.917
21	9CFLO	CORNUS FLORIDA	1	1.000	1.000
21	12EAME	EUONYMOUS AMERICANUS	4	62.000	15.500
21	13GBAC	GAYLUSSACIA BACCATA	8	258.000	32.250
21	18HHYP	HYPERICUM HYPERICOIDES	1	3.000	3.000
21	22LLIG	LYONIA LIGUSTRINA	7	33.000	4.714
21	23LMAR	LYONIA MARIANA	1	7.000	7.000
21	24MREP	MITCHELLA REPENS	2	21.000	10.500
21	28RNUD	RHODODENDRON NUDIFLORUM	2	49.000	24.500
21	31SALB	SASSAFRAS ALBIDUM	10	29.000	2.900
21	34VCOR	VACCIUIUM CORYMBOSUM	1	2.000	2.000
21	35VSTA	VACCINIUM STAMINEUM	5	16.000	3.200
21	36VVAC	VACCINIUM VACILLANS	12	423.000	35.250
21	37VTEL	VACCINIUM UNK SPP	1	7.000	7.000
21	50BTIN	BAPTISIA TINCTORIA	2	2.000	1.000
21	51CARX	CAREX SPP	7	40.000	5.714
21	54CACA	CYPRIPEDIUM ACAULE	5	17.000	3.400
21	55DNUD	DESMODIUM CF NUDIFLORUM	2	3.000	1.500
21	72ISOV	ISOTRIA VERTICILLATA	1	11.000	11.000
21	75LQUA	LYSIMACHIA QUADRIFOLIA	3	17.000	5.667
21	82GRAX	POACEAE SPP	2	45.000	22.500
21	87POTA	POTENTILLA CANADENSIS-SIMPLE	1	2.000	2.000
21	88PALB	PRENANTHES ALBA	1	1.000	1.000
21	92SRAC	SMILACINA RACEMOSA	1	3.000	3.000
22	1ASER	ALNUS SERRULATA	2	5.000	2.500
22	2AARB	AMELANCHIER ARBOREA	4	4.000	1.000
22	5CMAC	CHIMAPHILA MACULATA	2	4.000	2.000
22	9CFLO	CORNUS FLORIDA	5	12.000	2.400
22	13GBAC	GAYLUSSACIA BACCATA	11	267.000	24.273
22	19IVER	ILEX VERTICILLATA	2	3.000	1.500
22	22LLIG	LYONIA LIGUSTRINA	1	10.000	10.000
22	23LMAR	LYONIA MARIANA	1	1.000	1.000
22	28RNUD	RHODODENDRON NUDIFLORUM	10	199.000	19.900
22	31SALB	SASSAFRAS ALBIDUM	2	2.000	1.000
22	32SARB	SORBUS ARBUTIFOLIA	2	6.000	3.000
22	33VATR	VACCINIUM ATROCOCCUM	2	7.000	3.500
22	34VCOR	VACCIUIUM CORYMBOSUM	1	2.000	2.000
22	35VSTA	VACCINIUM STAMINEUM	4	20.000	5.000
22	36VVAC	VACCINIUM VACILLANS	10	232.000	23.200
22	39VDEN	VIBURNUM DENTATUM	4	16.000	4.000
22	51CARX	CAREX SPP	1	8.000	8.000
22	75LQUA	LYSIMACHIA QUADRIFOLIA	1	1.000	1.000
22	82GRAX	POACEAE SPP	1	11.000	11.000
22	84PBIF	POLYGONATUM BIFLORUM	2	4.000	2.000
22	124UHBT	DICOT HERB SP BT	1	3.000	3.000
23	2AARB	AMELANCHIER ARBOREA	4	8.000	2.000
23	3CPUM	CASTANEA PUMILA	1	1.000	1.000
23	9CFLO	CORNUS FLORIDA	2	2.000	1.000
23	12EAME	EUONYMOUS AMERICANUS	1	9.000	9.000
23	13GBAC	GAYLUSSACIA BACCATA	5	106.000	21.200
23	16GTRI	GILLENIA TRIFOLIATA	2	4.000	2.000
23	19IVER	ILEX VERTICILLATA	3	10.000	3.333
23	22LLIG	LYONIA LIGUSTRINA	1	1.000	1.000
23	28RNUD	RHODODENDRON NUDIFLORUM	8	120.000	15.000
23	29ROSA	ROSA SPP	1	9.000	9.000
23	31SALB	SASSAFRAS ALBIDUM	4	20.000	5.000
23	32SARB	SORBUS ARBUTIFOLIA	4	9.000	2.250
23	35VSTA	VACCINIUM STAMINEUM	4	8.000	2.000
23	36VVAC	VACCINIUM VACILLANS	8	199.000	24.875
23	39VDEN	VIBURNUM DENTATUM	5	31.000	6.200
23	51CARX	CAREX SPP	2	25.000	12.500
23	55DNUD	DESMODIUM CF NUDIFLORUM	3	6.000	2.000
23	56DPAN	DESMODIUM PANICULATUM	1	1.000	1.000
23	62GPIL	GALIUM PILOSUM	2	20.000	10.000
23	75LQUA	LYSIMACHIA QUADRIFOLIA	4	25.000	6.250
23	84PBIF	POLYGONATUM BIFLORUM	2	2.000	1.000
23	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	2	15.000	7.500
23	114UHOD	DICOT HERB SP OD	1	1.000	1.000
23	125FERF	UNKNOWN FERN SP F	2	2.000	1.000
24	2AARB	AMELANCHIER ARBOREA	2	3.000	1.500
24	5CMAC	CHIMAPHILA MACULATA	5	7.000	1.400
24	9CFLO	CORNUS FLORIDA	6	26.000	4.333
24	13GBAC	GAYLUSSACIA BACCATA	10	161.000	16.100
24	19IVER	ILEX VERTICILLATA	2	3.000	1.500
24	22LLIG	LYONIA LIGUSTRINA	4	37.000	9.250
24	28RNUD	RHODODENDRON NUDIFLORUM	4	42.000	10.500
24	31SALB	SASSAFRAS ALBIDUM	9	29.000	3.222
24	32SARB	SORBUS ARBUTIFOLIA	2	19.000	9.500
24	35VSTA	VACCINIUM STAMINEUM	10	72.000	7.200
24	36VVAC	VACCINIUM VACILLANS	13	268.000	20.615
24	38VACE	VIBURNUM ACERIFOLIUM	8	58.000	7.250
24	51CARX	CAREX SPP	4	116.000	29.000
24	52CVER	COREOPSIS VERTICILLATA	1	2.000	2.000
24	55DNUD	DESMODIUM CF NUDIFLORUM	2	5.000	2.500
24	58DVIL	DIOSCOREA VILLOSA	4	13.000	3.250
24	66GPUB	GOODYERA PUBESCENS	1	1.000	1.000
24	72ISOV	ISOTRIA VERTICILLATA	2	10.000	5.000

24	74LLAN	LYSIMACHIA LANCEOLATA	1	4.000	4.000
24	75LQUA	LYSIMACHIA QUADRIFOLIA	4	109.000	27.000
24	80PANX	PANICUM SPP NARROW LEAF	2	69.000	34.500
24	81PAWX	PANICUM SPP WIDE LEAF	1	6.000	6.000
24	82GRAX	POACEAE SPP	3	70.000	23.333
24	84PBIF	POLYGONATUM BIFLORUM	5	10.000	2.000
24	85PACR	POLYSTICHUM ACROSTICHOIDES	1	1.000	1.000
24	88PALB	PRENANTHES ALBA	2	5.000	2.500
24	91SELI	SCUTELLARIA ELIPTICA	1	2.000	2.000
24	92SRAC	SMILACINA RACEMOSA	1	4.000	4.000
24	94TPAL	THELYPTERIS PALUSTRIS-NOVEBO	3	70.000	23.333
24	110UHAY	DICOT HERB SP AY	1	25.000	25.000
25	2AARB	AMELANCHIER ARBOREA	4	8.000	2.000
25	3CPUM	CASTANEA PUMILA	1	2.000	2.000
25	5CMAC	CHIMAPHILA MACULATA	3	7.000	2.333
25	7CVIR	CHIONANTHUS VIRGINICUS	2	7.000	3.500
25	9CFLO	CORNUS FLORIDA	4	4.000	1.000
25	13GBAC	GAYLUSSACIA BACCATA	6	257.000	42.833
25	22LLIG	LYONIA LIGUSTRINA	5	20.000	4.000
25	28RNUD	RHODODENDRON NUDIFLORUM	13	229.000	17.615
25	31SALB	SASSAFRAS ALBIDUM	5	7.000	1.400
25	35VSTA	VACCINIUM STAMINEUM	8	83.000	10.375
25	36VVAC	VACCINIUM VACILLANS	9	210.000	23.333
25	39VDEN	VIBURNUM DENTATUM	1	4.000	4.000
25	49AUVI	AUREOLARIA VIRGINICA	1	1.000	1.000
25	51CARX	CAREX SPP	1	2.000	2.000
25	55DNUD	DESMODIUM CF NUDIFLORUM	1	1.000	1.000
25	58DVIL	DIOSCOREA VILLOSA	4	15.000	3.750
25	65GCAN	GEUM CANADENSE	2	5.000	2.500
25	66GPUB	GOODYERA PUBESCENS	1	2.000	2.000
25	73LFLA	LYCOPODIUM FLABELLIFORME	7	7.000	1.000
25	77OSEN	ONOCLEA SENSIBILIS	1	1.000	1.000
25	81PAWX	PANICUM SPP WIDE LEAF	1	2.000	2.000
25	82GRAX	POACEAE SPP	4	25.000	6.250
25	84PBIF	POLYGONATUM BIFLORUM	2	3.000	1.500
25	92SRAC	SMILACINA RACEMOSA	2	8.000	4.000
25	96VPAP	VIOLA CF PAPILIONACEA	1	1.000	1.000
25	111UHBA	DICOT HERB SP BA	1	1.000	1.000
26	2AARB	AMELANCHIER ARBOREA	1	5.000	5.000
26	3CPUM	CASTANEA PUMILA	3	10.000	3.333
26	5CMAC	CHIMAPHILA MACULATA	12	58.000	4.833
26	6CUMB	CHIMAPHILA UMBELLATA	1	9.000	9.000
26	9CFLO	CORNUS FLORIDA	10	60.000	6.000
26	12EAME	EUONYMOUS AMERICANUS	4	91.000	22.750
26	13GBAC	GAYLUSSACIA BACCATA	4	34.000	8.500
26	18HHYP	HYPERICUM HYPERICOIDES	1	1.000	1.000
26	22LLIG	LYONIA LIGUSTRINA	2	2.000	1.000
26	28RNUD	RHODODENDRON NUDIFLORUM	2	33.000	16.500
26	31SALB	SASSAFRAS ALBIDUM	8	15.000	1.875
26	32SARB	SORBUS ARBUTIFOLIA	1	2.000	2.000
26	35VSTA	VACCINIUM STAMINEUM	7	28.000	4.000
26	36VVAC	VACCINIUM VACILLANS	9	155.000	17.222
26	38VACE	VIBURNUM ACERIFOLIUM	10	52.000	5.200
26	39VDEN	VIBURNUM DENTATUM	9	25.000	2.778
26	40VPRU	VIBURNUM PRUNIFOLIUM	4	9.000	2.250
26	51CARX	CAREX SPP	6	82.000	13.667
26	52CVER	COREOPSIS VERTICILLATA	1	5.000	5.000
26	55DNUD	DESMODIUM CF NUDIFLORUM	15	136.000	9.067
26	56DPAN	DESMODIUM PANICULATUM	1	1.000	1.000
26	58DVIL	DIOSCOREA VILLOSA	4	12.000	3.000
26	61GCIR	GALIUM CIRCAEZANS	2	22.000	11.000
26	65GCAN	GEUM CANADENSE	3	6.000	2.000
26	66GPUB	GOODYERA PUBESCENS	4	14.000	3.500
26	68HVEN	HIERACIUM VENOSUM	2	2.000	1.000
26	70HPUR	HOUSTONIA PURPUREA	2	14.000	7.000
26	72ISOV	ISOTRIA VERTICILLATA	1	1.000	1.000
26	75LQUA	LYSIMACHIA QUADRIFOLIA	3	5.000	1.667
26	80PANX	PANICUM SPP NARROW LEAF	5	32.000	6.400
26	81PAWX	PANICUM SPP WIDE LEAF	3	56.000	18.667
26	82GRAX	POACEAE SPP	6	35.000	5.833
26	84PBIF	POLYGONATUM BIFLORUM	8	29.000	3.625
26	88PALB	PRENANTHES ALBA	1	2.000	2.000
26	91SELI	SCUTELLARIA ELIPTICA	3	5.000	1.667
26	92SRAC	SMILACINA RACEMOSA	9	26.000	2.889
26	93SCAE	SOLIDAGO CF CAESIA	5	18.000	3.600
26	115UHBI	DICOT HERB SP BI	1	1.000	1.000
26	116UHBK	DICOT HERB SP BK	1	1.000	1.000
27	2AARB	AMELANCHIER ARBOREA	1	7.000	7.000
27	9CFLO	CORNUS FLORIDA	1	2.000	2.000
27	13GBAC	GAYLUSSACIA BACCATA	9	721.000	80.111
27	31SALB	SASSAFRAS ALBIDUM	3	4.000	1.333
27	35VSTA	VACCINIUM STAMINEUM	6	180.000	30.000
27	36VVAC	VACCINIUM VACILLANS	13	445.000	34.231
27	75LQUA	LYSIMACHIA QUADRIFOLIA	1	3.000	3.000
28	2AARB	AMELANCHIER ARBOREA	3	14.000	4.667
28	5CMAC	CHIMAPHILA MACULATA	8	28.000	3.500
28	7CVIR	CHIONANTHUS VIRGINICUS	1	3.000	3.000
28	9CFLO	CORNUS FLORIDA	11	70.000	6.364
28	10CUNI	CRATAEGUS UNIFLORA	1	1.000	1.000
28	12EAME	EUONYMOUS AMERICANUS	1	12.000	12.000
28	13GBAC	GAYLUSSACIA BACCATA	7	66.000	9.429
28	31SALB	SASSAFRAS ALBIDUM	3	4.000	1.333
28	35VSTA	VACCINIUM STAMINEUM	5	17.000	3.400
28	36VVAC	VACCINIUM VACILLANS	13	561.000	43.154
28	39VDEN	VIBURNUM DENTATUM	4	7.000	1.750
28	40VPRU	VIBURNUM PRUNIFOLIUM	1	3.000	3.000
28	55DNUD	DESMODIUM CF NUDIFLORUM	5	44.000	8.800
28	58DVIL	DIOSCOREA VILLOSA	6	19.000	3.000
28	59ECOR	EUPHORBIA COROLLATA	1	1.000	1.000
28	75LQUA	LYSIMACHIA QUADRIFOLIA	1	36.000	36.000
28	81PAWX	PANICUM SPP WIDE LEAF	2	2.000	1.000
28	84PBIF	POLYGONATUM BIFLORUM	7	28.000	4.000
28	92SRAC	SMILACINA RACEMOSA	4	23.000	5.750
29	3CPUM	CASTANEA PUMILA	3	7.000	2.333
29	5CMAC	CHIMAPHILA MACULATA	5	31.000	6.200
29	7CVIR	CHIONANTHUS VIRGINICUS	4	18.000	4.500
29	9CFLO	CORNUS FLORIDA	14	107.000	7.643
29	13GBAC	GAYLUSSACIA BACCATA	3	34.000	11.333
29	21LBEN	LINDERA BENZOIN	2	4.000	2.000
29	25MRUB	MORUS RUBRA	1	1.000	1.000
29	30RARG	RUBUS SPP	1	1.000	1.000
29	31SALB	SASSAFRAS ALBIDUM	6	13.000	2.167
29	35VSTA	VACCINIUM STAMINEUM	3	36.000	12.000
29	36VVAC	VACCINIUM VACILLANS	7	208.000	29.714
29	40VPRU	VIBURNUM PRUNIFOLIUM	1	1.000	1.000
29	43USHG	UNKNOWN SHRUB G	1	2.000	2.000
29	44USHH	UNKNOWN SHRUB H	1	3.000	3.000
29	45USHI	UNKNOWN SHRUB I	1	1.000	1.000
29	55DNUD	DESMODIUM CF NUDIFLORUM	15	498.000	33.200
29	58DVIL	DIOSCOREA VILLOSA	1	1.000	1.000
29	61GCIR	GALIUM CIRCAEZANS	8	25.000	3.125
29	65GCAN	GEUM CANADENSE	4	5.000	1.250
29	66GPUB	GOODYERA PUBESCENS	1	1.000	1.000
29	81PAWX	PANICUM SPP WIDE LEAF	1	1.000	1.000
29	82GRAX	POACEAE SPP	1	6.000	6.000
29	84PBIF	POLYGONATUM BIFLORUM	4	10.000	2.500
29	86PREC	POTENTILLA RECTA	2	7.000	3.500
29	92SRAC	SMILACINA RACEMOSA	9	65.000	7.222

29	96VPAP	VIOLA CF PAPILLIONACEA	3	31.000	10.333
29	103UHAN	DICOT HERB SP AN	1	5.000	5.000
29	104UHAO	DICOT HERB SP AO	1	3.000	3.000
29	105UHAP	DICOT HERB SP AP	5	23.000	4.600
30	2AARB	AMELANCHIER ARBOREA	3	7.000	2.333
30	5CMAC	CHIMAPHILA MACULATA	1	1.000	1.000
30	9CFLO	CORNUS FLORIDA	2	9.000	4.500
30	13GBAC	GAYLUSSACIA BACCATA	10	884.000	88.400
30	28RNUD	RHODODENDRON NUDIFLORUM	4	15.000	3.750
30	31SALB	SASSAFRAS ALBIDUM	3	14.000	4.667
30	35VSTA	VACCINIUM STAMINEUM	8	127.000	15.875
30	36VVAC	VACCINIUM VACILLANS	14	502.000	35.857
30	54CACA	CYPRIPEDIUM ACAULE	4	8.000	2.000

STAND NO.	RICHNESS	TOTAL DENSITY	DIVERSITY (H' Shannon- Wiener)
1	39	1882.00000	2.69854
2	17	763.00000	1.68128
3	28	1312.00000	1.65693
4	25	2086.00000	1.21142
5	24	1481.00000	2.10301
6	29	1095.00000	2.11650
7	17	809.00000	1.21200
8	14	936.00000	1.59230
9	18	521.00000	1.47953
10	15	483.00000	1.59021
11	11	648.00000	1.81457
12	26	559.00000	2.22370
13	16	1426.00000	1.45070
14	16	633.00000	1.74190
15	23	1036.00000	1.80823
16	15	1594.00000	1.60452
17	10	933.00000	1.38912
18	24	1199.00000	1.80098
19	43	2312.00000	2.41236
20	13	1125.00000	1.83789
21	25	1114.00000	2.09170
22	21	817.00000	1.72723
23	24	633.00000	2.21196
24	30	1248.00000	2.66951
25	26	912.00000	1.92875
26	39	1094.00000	3.03422
27	7	1362.00000	1.03693
28	19	938.00000	1.64842
29	29	1148.00000	2.02415
30	9	1567.00000	1.06336

PART ONE OF TABLE

	SPECIES CODE	ST 1	ST 2	ST 3	ST 4	ST 5	ST 6	ST 7	ST 8	ST 9	ST10	ST11	ST12	ST13	ST14	ST15	ST16	ST17	ST18
1	ASER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	AARB	0.0	0.0	13.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	3.0	0.0	1.0	2.0	38.0	12.0	34.0
3	CPUM	0.0	3.0	0.0	0.0	0.0	2.0	12.0	0.0	4.0	1.0	0.0	0.0	0.0	0.0	29.0	0.0	0.0	0.0
4	CCAN	4.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CMAC	19.0	4.0	1.0	12.0	89.0	15.0	2.0	4.0	2.0	13.0	11.0	9.0	4.0	13.0	11.0	0.0	0.0	5.0
6	CUMB	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	CVIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	7.0	0.0	8.0	1.0	0.0	4.0	0.0	4.0	0.0
8	CALN	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	53.0	0.0	107.0
9	CFLO	76.0	2.0	37.0	66.0	5.0	144.0	35.0	0.0	77.0	18.0	9.0	13.0	0.0	8.0	42.0	0.0	3.0	3.0
10	CUNI	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	EREP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0	0.0
12	EAME	239.0	89.0	267.0	0.0	0.0	377.0	536.0	0.0	18.0	44.0	1.0	39.0	14.0	0.0	364.0	0.0	0.0	1.0
13	GBAC	0.0	33.0	14.0	178.0	170.0	0.0	0.0	266.0	14.0	44.0	133.0	21.0	614.0	211.0	16.0	268.0	347.0	12.0
14	GDUM	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	GFRD	0.0	0.0	51.0	2.0	5.0	0.0	0.0	0.0	5.0	0.0	168.0	0.0	0.0	0.0	9.0	386.0	132.0	370.0
16	GTRI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	HVIR	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	HHYP	0.0	0.0	0.0	0.0	2.0	0.0	0.0	11.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
19	IVER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	3.0
20	KLAT	0.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	LBEN	8.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	LLIG	0.0	17.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	29.0	0.0	0.0	0.0
23	LMAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	9.0	0.0	0.0
24	MREP	327.0	313.0	722.0	1473.0	65.0	45.0	143.0	91.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	MRUB	0.0	0.0	0.0	1.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	MCER	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	RATL	0.0	0.0	0.0	0.0	144.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0
28	RNUD	40.0	18.0	2.0	0.0	0.0	0.0	0.0	209.0	0.0	0.0	112.0	102.0	90.0	111.0	64.0	51.0	10.0	5.0
29	ROSA	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	RARG	1.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	SALB	0.0	0.0	0.0	13.0	52.0	8.0	15.0	7.0	5.0	18.0	3.0	7.0	18.0	14.0	5.0	10.0	31.0	83.0
32	SARB	0.0	0.0	0.0	0.0	2.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.0	0.0	0.0
33	VATR	0.0	0.0	0.0	13.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	7.0	0.0	1.0	2.0	0.0	0.0	5.0
34	VCOR	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
35	VSTA	0.0	1.0	4.0	133.0	102.0	28.0	22.0	7.0	45.0	50.0	72.0	21.0	23.0	104.0	31.0	78.0	26.0	119.0
36	VVAC	27.0	223.0	29.0	121.0	572.0	19.0	24.0	311.0	315.0	271.0	120.0	214.0	542.0	139.0	368.0	680.0	370.0	403.0
37	VTEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	VACE	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	VDEN	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
40	VPRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
41	USHA	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	MTRI	0.0	7.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	USHG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	USHH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	USHI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
46	APUB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	ATRI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	APLA	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
49	AUVI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50	BTIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
51	CARX	10.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	9.0	32.0	0.0	0.0	0.0	0.0	0.0
52	CVER	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53	CYVI	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54	CACA	0.0	0.0	0.0	0.0	3.0	0.0	0.0	1.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
55	ONUD	13.0	7.0	27.0	6.0	0.0	50.0	1.0	0.0	5.0	4.0	0.0	34.0	0.0	1.0	35.0	0.0	0.0	0.0
56	DPAN	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0
57	DRDT	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
58	OVIL	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
59	ECOR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	FVIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61	GCIR	66.0	0.0	2.0	0.0	0.0	263.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

62	GPIL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
63	GTIN	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
64	GALX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	GCAN	1.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
66	GPUB	4.0	4.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67	AVIR	109.0	29.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0
68	HVEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
69	HCAE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
70	HPUR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	IV-M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
72	ISOV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
73	LFLA	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
74	LLAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	LOUA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
76	MVIR	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0
77	DSEN	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
78	OCIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
79	OSTR	39.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80	PANX	0.0	0.0	0.0	0.0	2.0	3.0	0.0	6.0	0.0	0.0	3.0	0.0	23.0	3.0	0.0	0.0	0.0	0.0
81	PAWX	205.0	0.0	4.0	3.0	0.0	15.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
82	GRAX	223.0	0.0	18.0	4.0	151.0	16.0	0.0	4.0	5.0	1.0	0.0	0.0	16.0	0.0	0.0	2.0	0.0	19.0
83	PPEL	9.0	0.0	0.0	0.0	0.0	19.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
84	PBIF	155.0	8.0	4.0	18.0	9.0	0.0	3.0	0.0	8.0	3.0	0.0	3.0	6.0	2.0	1.0	0.0	3.0	0.0
85	PACR	116.0	0.0	53.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0
86	PREC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87	POTA	1.0	0.0	3.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
88	PALB	3.0	0.0	0.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
89	PAQU	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90	RREC	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
91	SELI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
92	SRAC	54.0	0.0	2.0	6.0	0.0	0.0	3.0	0.0	0.0	2.0	0.0	8.0	0.0	1.0	13.0	0.0	0.0	1.0
93	SCAE	7.0	0.0	4.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0
94	TPAL	51.0	0.0	20.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	5.0	0.0	0.0	0.0
95	UPER	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	0.0	0.0	0.0	0.0
96	VPAP	11.0	0.0	2.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
97	UHAA	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
98	UHAC	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
99	UHAE	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100	UHAD	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
101	UHAG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	UHAK	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
103	UHAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
104	UHAO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
105	UHAP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
106	UHAQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
107	UHAS	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	UHAT	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
109	UHAV	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
110	UHAY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
111	UHBA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
112	UHBB	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
113	UHBC	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
114	UHBD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
115	UHBI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
116	UHBK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
117	UHBM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
118	UHBN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
119	UHBO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
120	UHBP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
121	UHBQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
122	UHBR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	UHBS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
124	UHBT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
125	FERF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

PART TWO OF TABLE

SPECIES	CODE	ST19	ST20	ST21	ST22	ST23	ST24	ST25	ST26	ST27	ST28	ST29	ST30	TOTAL				
1	ASER	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
2	AARB	0.0	12.0	3.0	4.0	8.0	3.0	8.0	5.0	7.0	14.0	0.0	7.0	175.0	0.0	0.0	0.0	0.0
3	CPUM	1.0	0.0	0.0	0.0	1.0	0.0	2.0	10.0	0.0	0.0	7.0	0.0	72.0	0.0	0.0	0.0	0.0
4	CCAN	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0
5	CMAC	22.0	0.0	59.0	4.0	0.0	7.0	7.0	58.0	0.0	28.0	31.0	1.0	431.0	0.0	0.0	0.0	0.0
6	CUMB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0
7	CVIR	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	3.0	18.0	0.0	53.0	0.0	0.0	0.0	0.0
8	CALN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	165.0	0.0	0.0	0.0	0.0
9	CFLO	46.0	0.0	1.0	12.0	2.0	26.0	4.0	60.0	2.0	70.0	107.0	9.0	877.0	0.0	0.0	0.0	0.0
10	CUNI	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
11	EREP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0
12	EAME	569.0	11.0	62.0	0.0	9.0	0.0	0.0	91.0	0.0	12.0	0.0	0.0	2743.0	0.0	0.0	0.0	0.0
13	GRAC	6.0	103.0	258.0	267.0	106.0	163.0	257.0	34.0	721.0	66.0	34.0	884.0	5235.0	0.0	0.0	0.0	0.0
14	GDUM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
15	GFRO	0.0	509.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1637.0	0.0	0.0	0.0	0.0
16	GTRI	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
17	HVIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
18	HHYP	7.0	0.0	3.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	43.0	0.0	0.0	0.0	0.0
19	IVER	5.0	0.0	0.0	3.0	10.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
20	KLAT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0
21	LBEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	15.0	0.0	0.0	0.0	0.0
22	LLIG	14.0	0.0	33.0	10.0	1.0	37.0	20.0	2.0	0.0	0.0	0.0	0.0	203.0	0.0	0.0	0.0	0.0
23	LMAR	0.0	0.0	7.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0
24	MREP	662.0	171.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4033.0	0.0	0.0	0.0	0.0
25	MRUB	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	11.0	0.0	0.0	0.0	0.0
26	MCER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
27	RATL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.0	0.0	0.0	0.0	0.0
28	RNUD	0.0	0.0	49.0	199.0	120.0	42.0	229.0	33.0	0.0	0.0	0.0	15.0	1501.0	0.0	0.0	0.0	0.0
29	ROSA	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
30	RARG	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	34.0	0.0	0.0	0.0	0.0
31	SALB	0.0	3.0	29.0	2.0	20.0	29.0	7.0	15.0	4.0	4.0	13.0	14.0	429.0	0.0	0.0	0.0	0.0
32	SARB	0.0	31.0	0.0	6.0	8.0	19.0	0.0	2.0	0.0	0.0	0.0	0.0	82.0	0.0	0.0	0.0	0.0
33	VATR	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.0	0.0	0.0	0.0	0.0
34	VCOR	0.0	46.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.0	0.0	0.0	0.0	0.0
35	VSTA	7.0	57.0	16.0	20.0	8.0	72.0	83.0	28.0	180.0	17.0	36.0	127.0	1517.0	0.0	0.0	0.0	0.0
36	VVAC	75.0	84.0	423.0	232.0	199.0	268.0	210.0	155.0	445.0	561.0	208.0	502.0	8115.0	0.0	0.0	0.0	0.0
37	VTEL	9.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0
38	VACE	6.0	0.0	0.0	0.0	0.0	58.0	0.0	52.0	0.0	0.0	0.0	0.0	130.0	0.0	0.0	0.0	0.0
39	VDEN	0.0	33.0	0.0	16.0	31.0	0.0	4.0	25.0	0.0	7.0	0.0	0.0	137.0	0.0	0.0	0.0	0.0
40	VPRU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	3.0	1.0	0.0	17.0	0.0	0.0	0.0	0.0
41	USHA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
42	MTRI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0
43	USHG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0
44	USHH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0
45	USHI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
46	APUB	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
47	ATRI	54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.0	0.0	0.0	0.0	0.0
48	APLA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
49	AUVI	15.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0
50	BTIN	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
51	CARX	112.0	0.0	40.0	8.0	25.0	116.0	2.0	82.0	0.0	0.0	0.0	0.0	441.0	0.0	0.0	0.0	0.0
52	CVER	0.0	0.0	0.0	0.0	0.0	2.0	0.0	5.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0
53	CYVI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
54	CACA	0.0	8.0	17.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	41.0	0.0	0.0	0.0	0.0
55	DNUD	67.0	0.0	3.0	0.0	6.0	5.0	1.0	136.0	0.0	44.0	498.0	0.0	943.0	0.0	0.0	0.0	0.0
56	DPAN	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0
57	DROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
58	DVIL	10.0	0.0	0.0	0.0	0.0	13.0	15.0	12.0	0.0	18.0	1.0	0.0	109.0	0.0	0.0	0.0	0.0
59	ECOR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
60	FVIR	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
61	GCIR	10.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	0.0	0.0	25.0	0.0	388.0	0.0	0.0	0.0	0.0

62	GPIL	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0
63	GTIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
64	GALX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
65	GCAN	2.0	0.0	0.0	0.0	0.0	0.0	5.0	6.0	0.0	0.0	5.0	0.0	39.0	0.0	0.0	0.0	0.0
66	GPUB	13.0	0.0	0.0	0.0	0.0	1.0	2.0	14.0	0.0	0.0	1.0	0.0	41.0	0.0	0.0	0.0	0.0
67	AVIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	155.0	0.0	0.0	0.0	0.0
68	HVEN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
69	HCAE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
70	HPUR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0
71	IV-M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0
72	ISOV	1.0	0.0	11.0	0.0	0.0	10.0	0.0	1.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0
73	LFLA	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0
74	LLAN	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
75	LQUA	0.0	0.0	17.0	1.0	25.0	108.0	0.0	5.0	3.0	36.0	0.0	0.0	197.0	0.0	0.0	0.0	0.0
76	MVIR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
77	OSEN	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0
78	OCIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
79	OSTR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	0.0	0.0	0.0	0.0
80	PANX	0.0	0.0	0.0	0.0	0.0	69.0	0.0	32.0	0.0	0.0	0.0	0.0	141.0	0.0	0.0	0.0	0.0
81	PAWX	8.0	0.0	0.0	0.0	0.0	6.0	2.0	56.0	0.0	2.0	1.0	0.0	305.0	0.0	0.0	0.0	0.0
82	GRAX	122.0	57.0	45.0	11.0	0.0	70.0	25.0	35.0	0.0	0.0	6.0	0.0	830.0	0.0	0.0	0.0	0.0
83	PPEL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0
84	PBIF	90.0	0.0	0.0	4.0	2.0	10.0	3.0	29.0	0.0	28.0	10.0	0.0	399.0	0.0	0.0	0.0	0.0
85	PACR	15.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	215.0	0.0	0.0	0.0	0.0
86	PREC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	7.0	0.0	0.0	0.0	0.0
87	POTA	31.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0
88	PALB	6.0	0.0	1.0	0.0	0.0	5.0	0.0	2.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0
89	PAQU	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0
90	RREC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
91	SELI	0.0	0.0	0.0	0.0	0.0	2.0	0.0	5.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0
92	SRAC	160.0	0.0	3.0	0.0	0.0	4.0	8.0	26.0	0.0	23.0	65.0	0.0	379.0	0.0	0.0	0.0	0.0
93	SCAE	3.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0
94	TPAL	0.0	0.0	0.0	0.0	15.0	70.0	0.0	0.0	0.0	0.0	0.0	0.0	182.0	0.0	0.0	0.0	0.0
95	UPER	101.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	146.0	0.0	0.0	0.0	0.0
96	VPAP	12.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	31.0	0.0	70.0	0.0	0.0	0.0	0.0
97	UHAA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
98	UHAC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
99	UHAE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
100	UHAD	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
101	UHAG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
102	UHAK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
103	UHAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	0.0
104	UHAO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0
105	UHAP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	23.0	0.0	0.0	0.0	0.0
106	UHAQ	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
107	UHAS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
108	UHAT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
109	UHAV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
110	UHAY	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0
111	UHBA	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
112	UHBB	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
113	UHBC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
114	UHBD	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
115	UHBI	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
116	UHBK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
117	UHBM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
118	UHBN	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
119	UHBO	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0
120	UHBP	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
121	UHBQ	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
122	UHBR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
123	UHBS	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
124	UHBT	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
125	FERF	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0

APPENDIX E

There was little variation in soil tests between the high and low areas within stands, except in two stands. Stand 29 was located adjacent to a heavily grazed pasture and the low area that received runoff from this pasture had higher concentrations of calcium, magnesium and potash than the adjacent uplands. As both calcium and magnesium which are present in limestone are subject to loss from the soil by runoff (Brady 1974), the higher concentrations in the lowland soils is apparently a result of limestone application and runoff from the pasture. The high potash may also have been a result of the pasture runoff from cow manure and fertilizer.

In stand 24, the vegetation transect was severely disturbed by logging just after the vegetation sampling so that the soil was sampled in an alternate location in the stand. The lowland soil in the alternate location had higher calcium and magnesium concentrations than the upland soil, and it is not known whether these concentrations are comparable to those on the vegetation transect.

Because of the questionable nature of the soil results in stands 24 and 29, only the upland values were used in the analyses. The lowland comprised only 15 percent of the transect in stand 24 and less than half of the transect in stand 29, so that the lowland values were not representative of the whole stands.

VITA

[redacted]